Number 5 *Whole*
Volume XLIV *September, 1935* *Number 263*

THE

PHILOSOPHICAL REVIEW

THE PLACE OF TELESIO IN THE HISTORY OF PHILOSOPHY

I

BERNARDINO TELESIO along with Descartes, Bacon, Nicholas of Cusa and others has been put forward by certain historians of philosophy as the "first of the moderns". This phrase was first used in connection with Telesio by Francis Bacon in a context far different from that in which it or similar phrases are to be found in the writings of Fiorentino or Gentile. It is the purpose of this paper to contrast briefly these two views of Telesio as a modern, then to turn to the writings of Telesio to see what evidence they give of his "modernity".[1]

Bacon's reference to Telesio as the first of the moderns occurs in an unfinished treatise called *On Principles and Origins according to the Fables of Cupid and Coelum or the Philosophy of Parmenides and Telesio and chiefly of Democritus, treated according to the fable of Cupid.*[2] Among the Greek gods, Bacon states, there were two Cupids. One was the eldest, the other the youngest of

[1] Bernardino Telesio was born in 1508/9 at Cosenza, a town in Calabria in the kingdom of Naples, and died there in 1588. He studied mathematics, natural and moral philosophy at the University of Padua, receiving the doctorate in 1535. The first two books of his chief work, *De Rerum Natura,* were published in 1565 at Rome; the second edition of the same, together with three opuscula, *De iis qui in aere fiunt et de terramotis, De generatione colorum,* and *De mari,* in 1570 at Naples; and the third and complete edition in 1586 at Naples. His collected opuscula were published posthumously in 1590 at Venice under the title, *Varii de natu[illegible]ibus rebus libelli.* There is a modern edition of the *De Rerum Natura,* Vol. I, 1910, Modena; Vol. II, 1913, Genoa; Vol. III, 1923, Rome. There are two examples of Telesio's poetry in Vol. II of Francesco Fiorentino's *Bernardino Telesio,* Firenze, 1874. For further biographical details see Francesco Bartelli, *Note Biografiche,* Cosenza, A. Troppa, 1906. For bibliography and details of Telesio's philosophy, see *Telesio, the First of the Moderns,* Neil Van Deusen, 1932; Agent: *The Journal of Philosophy,* Columbia University, New York City. The references to the *De Rerum Natura* in this article are to the 1910-13-23 edition. Each volume contains three "Books".

[2] F. Bacon, *Philosophical Works* (Ellis and Spedding), X, 343-400.

the gods. It is of the elder that he wishes to speak. This elder Cupid was represented as parentless, *i.e.*, without a cause. Thus he was intended to represent unformed, primary matter. Now almost all the ancients, Bacon says, although they differed about first matter in other respects, agreed in this, that they set down matter as active, as having some form, as dispersing that form, and as having the principle of motion in itself. Among these there are four opinions regarding the principles of things: those who assert that there is one principle of things and the diversity of things consists in the inconstant nature of that principle; those who make the principle of things one in substance and that substance invariable, but deduce diversity of beings from the different magnitudes, positions, and so on of matter; those who hold that there are many principles of things; and, finally, those who hold that there are infinite or very numerous principles of things and that these principles are specific. The second alone represents Cupid as he is.

Parmenides and his modern disciple Telesio are thinkers who fall into the third group, Bacon thinks. The specific refutations of the Telesian philosophy need not detain us here. In all his criticisms Bacon attempts to show that Telesio, like all other men who preceded Bacon himself, has a thesis into which he tries to force the facts observed. For instance, he labors to explain the divorce of his primary qualities, heat, tenuity, mobility, and their opposites; that is, why they are separated at times and appear singly in things which seem on the whole to have the opposite qualities, as whiteness is joined to the coldness of snow. In this he behaves like his opponents, who, having formed their opinions, abuse the facts of nature when they come to particulars which do not fit their hypotheses. Telesio is led astray by blind devotion to the dogmas of his master Parmenides, according to Bacon, just as the Peripatetics are deaf to all doctrines not held by Aristotle.

Yet Bacon refers to Telesio as the "first of the moderns". An examination of the whole passage in which this phrase occurs reveals an attempt to tender a rather dubious compliment to a man whose ideas are about to be demolished.

> To some it may seem scarce worth while to take pains to refute the philosophy of Telesio, a philosopher not much spoken of or received.

> But I do not stand upon such points of dignity. For Telesio himself I have a good opinion and acknowledge him as a lover of truth useful to the sciences, the reformer of certain opinions, and the first of the moderns. At the same time, it is not as Telesio that I have to do with him, but as a restorer of the philosophy of Parmenides, to whom much respect is due. But my principal reason for being more full in this part is that in dealing with him who comes first, I take occasion to discuss many questions which may be transferred to the refutations of other sects of which I shall have to treat hereafter.[3]

The man who considers himself the first non-sectarian philosopher must necessarily convict all his predecessors of sectarianism. All that Bacon appears to have meant to imply by his attribution of modernity to Telesio is that Telesio was the first or among the first to attack Aristotle. He was better at destroying the old than at building up the new, according to Bacon, and this opinion was held by most of the writers on Telesio until Fiorentino in the latter part of the nineteenth century.

Telesio, according to Fiorentino and a number of other Italian scholars, is really the first of the moderns in a constructive as well as a destructive sense.[4] He, first of all, attempts an explanation of natural phenomena "according to their own principles". In view of such an attempt he is in harmony with the efforts of modern science, since he strives to discover these laws entirely through the aid given by nature herself, never through external aids furnished by theology, magic, astrology, or theosophy.

Thus Fiorentino's main thesis is that Telesio not only was among the first to turn away from Aristotelianism but was also the founder of modern natural science. But apart from the fact that we now know that the origins of modern science lie far back of the sixteenth century, there is sufficient internal evidence to mar Telesio's reputation for modernity very seriously. There is, for instance, the problem of the divine soul. Fiorentino states that Telesio admitted it in order not to break with the faith; but, coming to the functions to be attributed to it, he does not know what to say and contents himself with leaving it functionless. But this

[3] Bacon, *op. cit.*, 391.

[4] F. Fiorentino, *Bernardino Telesio, ossia Studi Storici su l'Idea della Natura nel Risorgimento Italiano*, Firenze, Vol. I, 1872; Vol. II, 1874.
G. Gentile, *Bernardino Telesio*, Bari, 1911.
E. Troilo, *Bernardino Telesio*, Modena, 1910.
E. Zavattari, *La Visione della Vita nel Rinascimento—B. Telesio*, Torino, 1923.

interpretation does not agree well with the evidence which Telesio gives for this soul. In the fifth book of the *De Rerum Natura* he says that man's striving for higher goods which are not included in the good of self-preservation is evidence for this immaterial soul. This soul, according to Telesio, rests upon empirical evidence as well as natural phenomena do.[6] It is true, as Fiorentino says, that it does not fit in well with the corporeal spirit, nor is it well defined; but it does not follow that it is entirely incongruous with Telesio's system, for the reason that it has observable effects and therefore there must be an entity which causes these effects.

Between the estimate of Bacon and that of Fiorentino on the originality and importance of Telesio's contributions to science there is obviously room for innumerable opinions. The interesting point is that each man sees Telesio in the light of his own philosophy rather than in terms of what Telesio himself was trying to do. For Bacon, Telesio is simply another restorer of an ancient philosophy; to the Hegelian Fiorentino, Telesio represents the synthesis after the thesis of scholasticism and the antithesis of renaissance astrology and magic. The question which it is the purpose of this paper to consider is: If we forget all about the Hegelian dialectic of history, if we put to one side all questions of the truth or falsity of the Telesian philosophy and ask simply what Telesio thought he was doing that had never been done before, and then search out the implications of this for his concepts of human and physical nature, what must be our estimate of his relation to the main streams of modern thought?

II

Telesio's own statement of his new insight is given very clearly in the preface to the 1586 edition of his chief work, *De Rerum Natura*. His predecessors, he feels, have been led astray by a faulty method. They have never really observed what they were investigating. For what can these men have known whose statements contradict each other as well as the things investigated? Their inconsistencies, Telesio believes, are due to the fact that they have not observed things and the powers, size, nature, and faculties with which things appear to have been endowed, but

[6] *De Rerum Natura*, Bk. 5, pp. 99-100.

have dared to investigate the principles and causes of the world by means of reason. Consequently, they have bestowed upon bodies, not the size and position which they appear to have been allotted, nor the dignity and powers with which they seem to have been endowed, but those which their own reason has dictated to be necessary. Telesio proposes, on the other hand, to investigate the world and the things contained in it as well as the passions, actions, operations, and appearances of the parts of the world and of the things contained in it, not trusting to reason, but as a cultivator of human wisdom which is as perfect as possible if it observes what sense presents and what can be learned by observation from the similarity of things perceived.[6]

The most important problem, then, in understanding Telesio would seem to be the question of the difference between sense or observation and reason as a method for investigating nature and the different views of man and nature which these methods reveal. It is obvious at the outset that if all valid human knowledge depends upon observation, only the properties of things which are sensible can be known by human beings. God's wisdom in constructing the world is unknown to us; hence we cannot know the ultimate causes of any phenomenon. Therefore Telesio states that he has been content to investigate the nature and substance of heaven by inquiring into the nature of the sun which has been made clear to us both as to its perceptible quality and its operation. As for other questions, of which there are many, and very worthwhile ones as well, he thinks no time should be spent upon them because it is impossible for man to know them. Therefore he intends to study only natural things and to give up inquiry into their causes.[7]

Hence it is clear that ultimate causes must remain a mystery to us. All that man can gather by means of his very limited cognitive powers is information regarding the constitution of the world and its operation.

What, then, is the view of the universe that man must hold if he observes, and how does this differ from the view of those who reason rather than observe? The first observation Telesio makes is of the existence of sun and earth and of their obviously con-

[6] *Op. cit., Proem,* pp. 5-6.

[7] *Op. cit.,* Bk. 2, pp. 151-2.

trary qualities. Sun and earth are not only far removed from each other in space but also in their essential characteristics, for the sun continually pours forth light and heat, moves and is tenuous, while earth is cold, inert, crass, and tenebrous. The realization of the opposition of sun and earth, however, leads to a more important observation regarding the cause of this opposition. The essential characteristics of sun and earth are heat and cold; all their other qualities are concomitant with but dependent upon these. Motion is the operation of heat; light is referred to as the appearance of heat. Heat and cold are the active forces which cause other things to be as they are. When sun acts upon earth it imposes its own nature and powers and drives out cold, density, and the other qualities proper to earth. On the other hand, cold, although not as powerful a force as heat, can force vapors into water and water into ice. If it does not make what is mobile absolutely immobile, it at least makes it somewhat torpid and everything excepting fire itself is somewhat affected by the nature of cold. Thus there is a continual struggle between these two forces and all beings are generated out of the conflict.[8]

But heat and cold are not sufficient in themselves to explain observable phenomena, for they are not corporeal. They are forces which account for the activity of things; they furnish no adequate explanation of the factor which is the basis of this activity, in which it occurs and to which it must be referred. Heat and cold are not corporeal because they always seem to emanate from sun and earth independently of any corporeal thing. Furthermore, when either enters the very deepest and densest things it permeates uniformly into every point, so that there is no point which is matter alone, but every point is one as well as the other. This would not happen if they were corporeal.[9]

The reason why it could not happen is not apparent from this passage, but in another place it is stated that heat does not enter matter like a vessel, so that there is a proportionate amount of space occupied to the amount of heat made, but rather it is implanted or impressed in matter and made one with it.[10] The inference seems to be that, if heat were corporeal, its ingression into matter would necessitate the occupation of a definite amount of

[8] *Op. cit.*, Bk. I, pp. 7-11.
[9] *Op. cit.*, Bk. I, p. 17.
[10] *Op. cit.*, Bk. I, p. 54.

space in proportion to the amount of heat, but, since the ingression of heat is qualitative, not spatial, its nature must differ as corporeal things which take up space differ from incorporeal things which do not.

So far, then, Telesio has observed two contrary forces, heat and cold, which struggle with each other for the possession of a homogeneous substratum. But if these forces work against each other blindly, how is it that one does not overwhelm the other and make all matter either hot or cold? In order that neither heat nor cold be overcome by the other Telesio maintains that a sense must have been put in each, a sense which indicates pleasure when something tends to preserve it and pain when something tends to destroy it. This is an ability to perceive both the proper passions and actions of the opposite principle and the power to escape and gather themselves up, and thus to husband their powers when they perceive the characteristic action of the other.[11]

This principle of self-preservation is universal. Heat and cold, and all inanimate beings, as well as plants and animals, strive to continue and perfect the natures and operations which are proper to them. This seems to involve some awareness of what is proper to any nature. But how can inanimate things be said to be conscious of what is proper to them? Telesio believes that we must not deny sense to inanimate beings because they have not the sense-organs of animals. For these organs serve as roads or channels by which the powers of external things and even things themselves are borne to the sentient substance within because animals are not made of a single substance but are diverse in nature. Other beings which are constructed simply of one substance have no need of sensoria. Furthermore, unless sense is proper to heat and cold, or at least to one of them, and hence to sky and earth or one of them, there can be no power of sensation in animals which have been constituted from them, for what faculty which is not in heaven or earth can be attributed to those things which are made by heaven or earth?[12]

This sense of self-preservation is the basis for individuation in all beings. For all beings tend to accept and further whatever gives the sense of being cognate and preservative to their nature,

[11] *Op. cit.*, Bk. 1, pp. 24-5.

[12] *Op. cit.*, Bk. 1, pp. 26, 27.

but tend to avoid or lessen the effects of anything which seems to militate against the welfare of the essence of their being. For instance, because spirit is desirous of preserving itself against all encroachments, it tends to remain the same and not to change into anything else, and this characteristic is not peculiar to spirit but is a quality of all things.[13]

We now have before us the fundamental observations of Telesio on the nature of the universe. Nature presents itself to him as a substratum activated by two forces, heat and cold. These two forces penetrating matter and reacting upon each other generate all things. But they not only create beings but preserve them when once created, for each tends to combat the other, and even different degrees of the same force, in order to maintain the essence of the being unimpaired.

Now, although Telesio distinguishes four natural principles, heat, cold, matter, and the *conservatio sui ipsius*, it turns out as one observes Telesio's procedure that they are not all of equal importance in understanding the physical universe. Heat seems to be his fundamental discovery and the real generative force in cosmology. Although cold is spoken of also as an active nature, it tends gradually to become identified with earth and matter in Telesian usage, rather than to operate as a force opposed to heat. Thus we are told that no being has been created by cold but all owe their natures to heat. Again, one reason for attributing to matter the tendency of unsupported objects to fall is that cold has not been given the power of falling but abhors all motion. This may seem to contradict any assertion of the identity of cold and matter, but it can be seen that it does even more violence to the essence of cold as an active nature. Furthermore, the appearance of cold, matter, and earth is unknown. The appearance of cold must not be inquired into, but Telesio attributes blackness to both earth and matter. Moreover, the characteristics of earth are identical with those of cold and matter.[14]

Everything in Telesian usage seems to indicate two cosmological factors which are of supreme importance for a philosophy of observation: an active factor, heat or force; and a passive but resistant material factor, cold or matter. Sun and earth are the

[13] *Op. cit.*, Bk. 9, p. 196.

[14] *Op. cit.*, Bk. 1, pp. 61, 19, 20.

tangible observable embodiments of force and matter. An examination of the Telesian concept of essence makes this point clearer, for the emphasis here is upon the fact that the essence of any object is constituted by a certain capacity for action and a certain ground for that action.[15]

What the "new road" of observation really displays, then, is matter or stuff operating in various ways. The two elements can not be observed separately. Moreover, the nature of the operator or the cause of operation is unknown to man and must not even be investigated. There is no observable operator, there is only operation. Thus all beings, Telesio holds, and all their parts and even all their points have been composed of matter and an active nature deeply commingled and made like one, and no being appears to produce any action or operation which is not proper to the other of the natural agents. It is clear that matter has been endowed with no power to act or operate, nor was created by God to act or operate, but rather to receive the active natures, and having been made one with them, to produce their characteristic actions and operations.[16]

But matter and force are not the only factors observed, although they are the fundamental ones. These factors tend to maintain certain relations to each other both in the universe as a whole and in each individual being. This factor of self-preservation, however, differs from matter and force in that it is a power of heat and cold and matter rather than a factor discovered by observation and analysis to be entirely independent of them as they are of each other. In other words, the *conservatio sui ipsius* becomes intelligible in terms of the more fundamental interaction of force and matter rather than independently of them.

We are now in a position to raise the question as to Telesio's conception of his predecessors' method. If this is "observation", what would "reason" have revealed and why is "observation" better?

One fact seems immediately evident from our treatment: both Telesio and his predecessors (of whom the chief in his own mind is Aristotle) have recognized the same factors in existence. They

[15] See *Telesio, the First of the Moderns*, by N. C. Van Deusen, pp. 42, 69.
[16] *De Rerum Natura*, Bk. 4, p. 68.

are dealing with the same subject-matter. Telesian philosophy has equivalents for the Aristotelian efficient, material, formal, and final causes. Heat, for Telesio, is the efficient cause, the cosmological factor which explains movement and change. Cold, earth, matter, all tend to signify the Aristotelian material element. This inert, passive, yet resisting substratum forms the complement of heat in all things. Heat and matter together constitute the basic natures of all beings.

While Telesio seems to have felt that heat and matter (or the efficient and material causes) are the fundamental cosmological factors, he did not neglect problems unanswered in terms of these factors. The principle of self-conservation is an attempt to give an equivalent for the Aristotelian formal cause in terms of efficient causation. The integrity of the world-elements, heat and matter, as well as that of every being constituted by them, depends upon the power of these forces to maintain their identities. Essence is not to be understood in terms of exclusion from or inclusion within a genus, but in terms of physical forces. What a thing is depends upon the degree of heat which constitutes its nature.

No amount of prestidigitation can explain the Aristotelian final cause satisfactorily in terms of efficient and material causation, but a translation had to be made if the genetic process were to mean anything in the Telesian observational philosophy. Telesio seems to explain the development of beings already created as tendencies of beings to perfect themselves, and seems to consider the powers of conservation and of perfection as intimately bound up with each other. It is difficult to see how the same heat can both preserve the *status quo* of the individual and yet cause it to develop or perfect itself. The first creation of beings is due, of course, to the action of heat on matter.

Thus it is not the subject-matter considered which differentiates observation and reason. Both deal with the same world and have equivalent terms for factors noticed. But there is one great difference. For Telesio the factors which seem to shed most light upon the operations and constitution of nature as he analyzes it are heat and matter (cold, earth) which Aristotle would have termed the efficient and material elements. The formal and final factors,

insofar as they have any explanation in an observational philosophy, are intelligible as aspects or qualities of matter and force.

Aristotle, of course, reverses this emphasis. "In all sciences that are concerned with principles or causes or elements, it is acquaintance with these that constitutes knowledge or understanding . . . [Furthermore] the path of investigation must lie from what is more immediately cognizable and clear to us, to what is clearer and more intimately cognizable in its own nature."[17] Particular sense-qualities are "what are more immediately cognizable and clear to us"; universal rational principles are more "cognizable in their own nature". From this passage it is evident what sort of data Aristotle considers most important for science.

Thus "observation" leads Telesio to recognize only the material and efficient factors of things as valid science. Aristotelian distinctions naturally seem to him more arbitrary than scientific. They appear to him to depend upon skillful juggling of words rather than upon close observation of things themselves. An example follows which shows what he thinks of Aristotelian metaphysical terms, terms which imply for him a sophistical use of "reason" rather than a clear "observation" of actual facts.

Telesio quotes a passage from the *De Generatione et Corruptione* in which Aristotle, speaking of how constituents of a compound may combine, says that some things are potential while others are actual; so, it is possible that things which are in combination may exist in a certain sense and not exist in another sense. The compound may in actuality be something other than the constituents from which it has resulted; nevertheless, each of them may still in potentiality be what it was before it entered into the combination. It is clear, Aristotle holds, that the combining constituents not only coalesce but can also again be separated from the compound. Therefore, the constituents neither persist actually as "body" and "white" persist, nor are they destroyed, for their power or potentiality is preserved.

At this point Telesio explodes.

> By Hercules, Aristotle is much indebted, as he himself ingenuously confesses, to the distinction between actuality and potentiality, thanks to which he need not despair of getting out of any tight scrape. Thus

[17] Aristotle, *Physics*, I, 1 (Loeb translation).

> he is not afraid to hold that all the elements, although forced into some other thing, and that thing uniformly one and the same and wholly different from the individual elements, are nevertheless preserved individually and are separated from each other; that is, the individual elements are preserved and not preserved, and all have been made the same and yet remain different and contrary. But it is necessary that he who would explain the nature of things show things to be true and possible which appear to be false and impossible not by means of distinctions and meaningless terms, but by the things themselves. Since, however, things which are clear to sense, and insofar as they are sensible, are to be investigated, so all things must be explained and clarified by observation and those especially which seem contrary to observation.[18]

The same opposition between "reason" and "observation" is evident in Telesio's psychology as contrasted with that of Aristotle. Here again the philosophy of "observation" reveals efficient and material causes and can find no evidence for final or ultimate causes. The characteristic which distinguishes animate beings from other beings is the possession of a soul. This soul is nothing mysterious, immaterial or immortal, but is rather a very tenuous, lucid, mobile, but none the less corporeal substance continuous with itself throughout the body and generated, together with body, from semen rather than by sun and earth as other beings are. This soul, or spiritus as it is called to distinguish it from the divine soul which is peculiar to man, is the locus to which all animate functions must be referred. Thus, in the case of man and animals, this soul senses, reasons, imagines, remembers, moves the body, and desires. Although never visible because of its extreme tenuity, it is present in every part of the body except the bones and parts similar to the bones; but it is especially plentiful in the nervous system, particularly in the ventricles of the brain.[19]

Just as in physical nature Telesio discovers an active and a passive factor, so in human nature he finds corresponding elements. Spiritus is the sun of the body and the chief factor to be studied if one is to gain an understanding of human nature. Similarly, self-conservation is the *summum bonum* for spirit as for all other individuals. This is the object of all desire and the criterion of virtue and vice. Virtues are those faculties which are effected by nature or teaching or both and operate in such a way

[18] *De Rerum Natura*, Bk. 3, pp. 307-8. [19] *Op. cit.*, Bk. 5.

as is necessary in order to insure the conservation and perfection of spirit; and they cannot be enticed to act because of any pleasure, if their action crushes spirit, or causes it to deteriorate, or even hinders its perfection. Nor are they kept from acting by any labors or injuries, nor even by any dangers, when spirit is to be preserved or perfected by their operation; but they continually do whatever brings about the conservation and perfection of spirit. On the other hand, the same faculties are vices when spirits delighted by the pleasure of acting do not cease to act even if threatened by the worst evil, or wnen they grow lazy, or fear to act, when their action would either perfect or conserve spirit.[20]

Such, in broad outline, are the Telesian observations upon the nature of the spiritus. All animate functions such as memory, desire, sensation, and even reasoning and bodily movement are referred to expansions and contractions of this spiritus or are explicable as perceptions of these expansions and contractions. In short, when Telesio looks at human nature as he looks at the world at large, he sees similar factors present and functioning there. Efficient and material factors are observed in the soul as well as in the universe. Now just as this insistence upon matter and force as the only real data observed prevented an understanding of how genesis is possible in the world about us, so in the psychology the explanation of the mechanics of sensation has excluded many of the facts which Telesio observed as he looked about him. That is, there are facts "observed" by Telesio which his psychology of sensations cannot explain.

The best psychological example of this discrepancy between what Telesio observes and his analysis of the observational process is his account of universals. Universals, he holds, are only common names for groups of individuals which more or less resemble each other. Human senses are unable to distinguish the most minute differences of things; so we conclude that they are the same. All such things must be held to be one and must be placed in the same class.[21]

Moreover, no science, Telesio states, is really based upon such universals, or upon any other purely non-sensible material. Mathe-

[20] *Op. cit.*, Bk. 9, p. 201. [21] *Op. cit.*, Bk. 9, p. 259.

matics, which seems to deal with abstract things, is really concerned with sensible objects. But it deals with them through signs, not directly; hence it is inferior to natural science which is based directly upon sensations.[22]

But universals do not seem to be entirely intelligible in terms of groups of similar particular sensible objects. For what is the criterion of similarity? What determines whether borderline cases shall go into one genus or into another? What is the standard for judging the excellence of any individual? Telesio's answer is that only those individuals are good and perfect of their kind which have been constituted by the nature from which beings of this kind must have been constituted. Things which vary slightly from this generic nature may still be within the genus but must not be held to be good or perfect members of that class. Thus not all that appears to be is really gold, or at least not good gold, but only that which has been given the characteristic and pure nature of gold. Hence all perfect individuals must possess such characteristics both as to quality and to quantity as beings of this genus should have.[23]

This passage seems to indicate a generic nature separate from any particular sensible thing or group of sensible objects, which is a criterion not only for the inclusion or exclusion of a particular object in or from a particular genus, but for judging the excellence of individuals. It is difficult to see how this generic nature can be known by means of sensation as Telesio describes it. Universals are derived from the similarity of numerous individuals and are nothing actually existing.[24] But it is clear that these generic natures are not universals of this kind, for if they were not true norms but only generalizations from individuals, they could not be standards for the excellence of individuals in those groups. If the universal essence or nature of a genus is constituted by a generalization of the similarities of the individuals of that genus, the "bad" specimens as well as the "good" must be taken into consideration, and then our basis for differentiation has vanished.

This discussion of universals is important for our discussion

[22] *Op. cit.*, Bk. 8, p. 99.
[23] *Op. cit.*, Bk. 9, p. 259.
[24] *Op. cit.*, Bk. 5, p. 150.

only because it shows what observation becomes for Telesio. Telesio begins his study of the nature of things with the idea of looking at things and arriving at natural laws directly rather than beginning with categories and laws and attempting to make the facts fit the theory as he feels that Aristotle does. But, as he goes on with his investigation of nature, certain facts impress him as fundamental and around these facts he tends to organize everything he sees. Thus, in the cosmology, matter and force seem more fundamental than purpose and essence; hence the latter are translated into terms of the former, as we have seen. The same translation occurs in the psychology. Telesio begins his investigation of the nature of things with the espousal of the observational method of procedure; he arrives at his specific theory of sensation and reason when he turns this method of procedure upon human nature. As soon as he formulates his theory in terms of matter and force such things as generic natures become difficult to understand. Universals may be described as groups of similar particular individuals, and in this way they may be intelligible in terms of a mechanistic theory of sensation, but the criterion of similarity and excellence remains outside the theory. Yet these generic norms are observed in the sense in which Telesio conceived of observation in the beginning. They are only non-observable in terms of the theory which developed as he proceeded.

Consequently, we must not take Telesio too seriously when he insists upon sensation as the basis of knowledge, and reason as only an imperfect kind of sensation, for his procedure everywhere gives the lie to his theory of knowledge. We have pointed out the difficulties in his doctrine of generic natures which arise if all knowledge is a matter of definite physical changes in spiritus; matter, memory, perception are other concepts discussed by him which are unexplained in terms of his theory of knowledge. The question how God and the divine soul are known by man is unintelligible in terms of expansions and contractions of spirit (a fact of which Telesio is aware), but in this instance he discovers evidence for them by observing the world and man. Thus his theory of knowledge is itself an "observation" rather than an explanation of what observational procedure is.

The controversy between sense and reason, then, turns out to be a conflict of emphasis as to what are the most important factors for an understanding of the universe rather than a methodological quarrel. For Telesio's account of sensation and knowledge is obviously not broad enough to include all the "observations" we find in his pages; and, furthermore, Aristotle's method of discovery is ultimately grounded upon sensation. The real controversy between sense and reason is a conflict of material and efficient against formal and final causes as fundamental explanations of the nature of things.

III

With this point in mind Telesio's relation to modern thought becomes clearer. It is not as a mathematical physicist that he can claim kinship with the moderns, for, although some of his concepts such as space and time are similar to those of Newton, his cosmology as a whole bears almost no relation at all to the universe as revealed by modern physics. To sixteenth-century scientists interested in the exact mathematical formulation of laws of motion, Telesio's exposition of all change in such vague terms as heat and cold must have seemed impossibly gross. But, although his expression of his conception of force in terms of expansions and contractions of matter was inconsequential in terms of modern science, his fundamental observation that matter and force and their interrelations are the chief factors to be understood in nature emphasizes the aspects of nature which were to interest subsequent science. He did not possess the mathematical tool of modern science, but he did study the same subject-matter, bodies and their observable motions, rather than the powers of bodies.

This emphasis upon the mechanics of things rather than upon their uses or purposes led to more characteristically modern conceptions in psychology and theology than in physics. For Telesio the soul, as we have seen, was no form of the body, but a body itself which by various expansions and contractions not only moves the body, but senses, reasons, desires, remembers, and performs all the other cognitive functions. Crude as this notion is, it represents a distinct break with the idea of the soul as something supernatural added to the body to make it immortal, as well as with the idea of the soul as an incorporeal entelechy of the body. The

soul which Telesio describes has an observable corporeal structure and its functions involve changes in the body. Modern psychology has tended to throw the term 'soul' and even its successor 'consciousness' into the discard, but it has gone on investigating nerve-physiology and bodily structure to find out how psychical processes take place.

It is, however, in Telesio's theological opinions that the most typically modern positions are taken. God is read out of the natural world except as the creator and director of the natural principles, heat and cold. Nothing besides heat and cold is needed to explain the present natural processes; but there must have been a beneficent first cause of these principles, else we could not explain the harmony and perfect adaptation found in natural things. God is no longer the final factor in the universe making for perfection but only the efficient cause which set the machine in motion. With all ultimate causes banished as unintelligible to man, with only observable expansions and contractions recognized as humanly cognizable, it is clear that, if God is to be conceived at all, it must be in terms of efficient causation.

This change from a God who is the final cause of the universe, the goal which gives natural activities their direction, to a God who set natural activities going and whose consummate craftsmanship guarantees their mechanism to be everlasting is precisely that which we find in many seventeenth-century writers. For instance, for Galileo the real world is a succession of atomic motions in mathematical continuity. The only way for Galileo to keep God in the universe is to invert the Aristotelian metaphysics and to regard God as the first efficient cause or Creator of the atoms. God ceases to be the Supreme Good and becomes a huge mechanic whose power is appealed to merely to account for the first appearance of the atoms, the tendency becoming more and more irresistible as time goes on to lodge all further causality in the atoms themselves.

In conclusion, it would seem that Bacon underestimated and Fiorentino overestimated Telesio's position in modern thought. Telesio seems to be something more than a mere critic of Aristotle and plagiarist of another ancient philosopher, and he seems to be something less than the genius who suddenly tossed aside super-

stition and investigated nature according to her own laws. He does seem entitled to a place in the long line of thinkers whose orientation is towards observation of physical phenomena in terms of matter and force, which lend themselves to mathematical treatment, rather than in terms of the specific individual powers of objects. The details of his analysis are characteristic of the sixteenth century, but his general attitude towards the world is that of the scientists of the following century. His feet were planted in the controversies of his day, but his eyes looked in the direction from which the great discoveries of future science were to come.

NEIL VAN DEUSEN

COLUMBIA UNIVERSITY

PLATO ON SCIENTIFIC MEASUREMENT AND THE SOCIAL SCIENCES[1]

MEASUREMENT today usually signifies a set of operations performed with measuring rods or other instruments upon a given set of entities to render possible their approximate identification with the set of number-values constituting the scientific object, which in turn can be substituted for the variables in an equation. This is accomplished in proportion as qualitative determinations can be reduced to quantitative ones. And as a result the policy and plan of development of modern science is determined by the belief that the measure of our knowledge of the real world lies in its approximation to the 'bare quantities'. The meaning of the numbers employed is often restricted to their treatment as quantitative magnitudes, and measurement is considered possible only under the category of quantity. Consequently, it is thought that we can have an exact science only where quantitative observable facts are given which are sufficiently concrete for the application of various instruments of measurement. We have lost sight of the fact that Galileo's dictum, "Measure whatever is measurable, and seek to render measurable whatever as yet is not", is a highly oracular statement, capable of several interpretations, each of which may lead into the tangle of a tragic error, when faithfully pursued, as certain of the Greeks like Sophocles, who devoted themselves to the interpretation of oracles, have shown.

An example of one such interpretation is the quantitative one so indispensable to the advance of modern science during the past three centuries. And its success, purchased in terms of this emphasis on one category, has been paid for by a resulting loss of insight into other categories involved, and in some instances even by a degeneration into a mere set of operations performed upon a set of entities which are considered as given absolutely in and for themselves. Thus Bridgman has acknowledged the validity of only those scientific concepts for which the corresponding operations can be performed, and consequently certain physicists have

[1] The writer wishes to acknowledge his obligations to his colleagues, to Professor C. M. Sparrow for his helpful discussions on scientific measurement, and to Professor S. Buchanan for stimulating whatever degree of insight into Plato's doctrine has been achieved.

been accused of thinking with their hands. What were previously theories have become embodied in the instruments, and this concretization makes them seem so real that we lose sight of their speculative character. Furthermore, the so called social sciences, seeking to escape from mere sentimental oratory, and captivated by the tidy systematic results of the more exact sciences, have also sought to bring their complex and recalcitrant data under the category of quantity, not realizing that Galileo, in being a mathematical physicist, was also a rhetorician. The result is an extremely literal interpretation of the above dictum, where measurement becomes reduced to a random gathering of data, a haphazard set of trial-and-error activities, having no specific relevance to anything, and presenting a scene very dismal to behold, where instruments have taken the place of ideas, and whatever confused theory there is becomes hopelessly entangled in the meshes of its own facts.

For assistance in escaping from these arbitrary restrictions placed upon the interpretations of our oracle, it seems reasonable to turn to Plato, himself the son of Apollo. He insists upon the possibility of various meanings, their nature, and an understanding of their complementary use. In other words measurement must be understood in its metaphysical implications before its application to data can become fully effective; stated in its most general and vague form, the subject-matter of measurement is actually the analysis of a given field of data by rendering determinate what was previously indeterminate. This brings us to two fundamental concepts of Greek Philosophy, πέρας and ἄπειρον, variously translated as the finite and the infinite, the bounded and the boundless, the limit and the unlimited, the determinate and the indeterminate, respectively. This analysis may mean merely the reduction of indeterminate sense-qualities to determinate quantities. But it may also mean the ordering and determination of hitherto confused categories, leading to the relatively systematic knowledge of the lawfulness of appearances; for that reason both Pythagoras and Plato held that πέρας and ἄπειρον were the fundamental principles of the real, and found in the πέρας or 'measure' the methodological principle of eternal unity and being, and even of truth, beauty and goodness. This necessitates an insight into even higher orders of universality, ranging between the limits of non-being and being,

in order for our analysis to find its foundation beyond the realm of shadows. Otherwise our measurement will not be able to lay hold of the intelligible being of things so as to reflect their true nature but will fall into the empirical quagmire, like those teachers of harmony mentioned in the *Republic* (531 f.) "who compare the consonances and sounds which are heard only, and their labor is in vain. . . . They tease and torture the strings, and rack them on the pegs of the instrument . . . and make accusations against the strings both of their backwardness and forwardness to sound . . . They put their ears close alongside of the strings like persons catching a sound from their neighbor's wall—one set declaring that they distinguish an intermediate note, and have found the least interval which should be the unit of measurement; the others insisting that the two sounds have passed into the same—either party setting their ears before their understanding".

For a simple example to illustrate the varying levels of meaning and universality which from Plato's point of view are implied in the Galilean dictum concerning measurement, let us turn to the Pythagorean theory of music, and by employing our two principles of the πέρας and ἄπειρον proceed from the shadows of sensation to the dialectical treatment of measurement as it is found in Plato's more systematic thought. We choose music advisedly; its most fundamental concept is that of measure.

Here the ἄπειρον or indeterminate would be a continuous tone-range from low to high pitch, as given by a siren-whistle or a monochord with a sliding bridge. The first step in differentiating this continuum by the πέρας would be its analysis into whole- and half-tone intervals, grouped in scales. At this point we can distinguish the four fundamental string-lengths corresponding to the notes of the Greek four-stringed lyre, and the Pythagorean measurement begins. The sounds heard from the strings are vague, particular, fleeting and indeterminate sense-qualities, especially if one is born without absolute pitch. This flux must be grasped for knowledge in terms of its exact, universal, eternal, intelligible being. The Pythagorean's first step, obviously, was to identify the heard sounds with the actual string-lengths which were more amenable to measurement; but in doing this a proportionality between tones and strings is assumed. The strings may give

the notes C, F, G, C′, and if we designate the four tones by the letters *x*, *y*, *z*, *u*, then we have the following proportion: *x*:C::*y*:F::*z*:G::*u*:C′. The next step is to reduce the qualitative sensations to measured quantities by numbering the strings. But here again 'measured quantity' contains a subtle meaning fundamental to the Platonic philosophy; if it is missed many confusions and mysteries arise. The strings show obvious quantitative differences of length; all observers would unerringly order them in their proper relation on that basis. Therefore why not number them 1, 2, 3, 4, or bring them under the category of quantity by using any arbitrary unit of measurement such as the difference of string-length between the enharmonic and chromatic quarter-tone, used in the theory of Aristoxenus?[2] This would give the relations of before and after, or less, greater and equal, but such a purely quantitative ordering by numbers does not necessarily imply knowledge which is exact and systematic in the most desirable sense. Any other conventional series such as the alphabetical order of letters would serve equally well, and the strings could be measured by calling them A, B, C, D. But the use of numbers seems more scientific to the unwary, and for example one may be misled by the apparent exactness of the number of an I.Q. found in psychological measurements.

The point to be noticed in the application of numbers to data is that the number-series does not merely possess the additive properties expressing relations of greater, less and equal, but also what are called the multiplicative properties, expressed by various exact ratios between numbers. If we bear in mind that the Greek word for ratio is *logos*, which meant the intelligible being embodied in things, the point becomes significant. Each thing, including our lyre, embodies its own aspect of the *logos*. If measurement is to lead to knowledge, it must, by the proper use of numbers, reveal that intelligible being, lying concealed beneath the shadows and particularities of sense-perception; or, in Platonic terms, by the use of mathematicals which are the connecting link between ideas and things. This can be accomplished only if numbers are applied to things so that the ratios expressed by the numbers exactly reflect the *logos* involved in the things; in other words so that not merely

[2] *Cf.* Frank, *Plato, Beilage* I.

the additive but also the multiplicative properties of the numbers apply; again, measurement is completed only when we discover multiplicative properties or 'intensive magnitudes' determining functional interdependencies or proportionalities between the additive or quantitative magnitudes; these intensive magnitudes appear as absolute or material constants in natural laws, such as the index of refraction n in Snell's law.

In the case of the lyre, the Pythagoreans numbered the strings 6, 8, 9, 12, and found the ratios involved to be expressed in the proportion 6:8::9:12. Here the indeterminate data have been analysed in terms of the determinate number-series so as to reveal their *logos* or intelligible being, which is not given directly by a naïve empirical observation. This proportion may now be added to our previous one, and consequently can be applied not only to the strings, but also to their corresponding sounds. In this way the vague flux of a particular sense-experience has been grasped for knowledge in terms of its πέρας or determinateness. Here the Pythagorean theory of measurement ends; for Plato, however, we have not yet separated out the idea incarnate in this particular bit of experience, but only achieved the halfway house of the mathematicals. The Pythagoreans thought of their ratios too concretely to satisfy the refined dialectic of Plato. In the seventh book of the *Republic* (531 C) he points out that the Pythagoreans "investigate the numbers of the harmonies which are heard, but they never attain to problems, that is to say, they never reach the natural harmonies of number, or reflect why some numbers are harmonious, others not". Thus mathematics is capable of two uses. It may be employed merely in its application to things in the spirit of a shopkeeper to drag the mind back toward the shadows if the necessities of mathematics are confused "with those of daily life". On the other hand we may realize that knowledge of being rather than becoming is the real object of the whole science, and "then mathematics will draw the mind toward truth and create the spirit of Philosophy, and raise up that which is now unhappily allowed to fall down" (525-6-7).

So for Plato, although our proportion embodies the desired idea, it may easily be missed unless we ascend to a next higher level of universality. From the point of view of the concrete, individual

lyre, the proportion is a universal. But if we place another proportion such as 12:16::16:20 besides the previous one, 6:8::9:12, we find that the latter embodies a still more universal Idea, namely the specific proportionality of certain definite ratios R_1, R_2, R_3, R_4. Seen from this point of view, it is clear that the quantitative unit of Aristoxenus' theory which varies from octave to octave has been superseded by the following ratios: taking the fundamental tone as 1/1, the octave is 2/1, the fourth 4/3, and the fifth 3/2. The octave is no longer halved or divided up atomistically into quantitative units as the previous theory had attempted to do, but is divided harmonically, with the parts related in terms of their multiplicative properties by the proportion $4/3 \times 3/2 = 2/1$. This employment of the numbers 1, 2, 3, 4 for the purpose of measurement does not classify the strings on the basis of their length, but by making use of the multiplicative properties of the numbers reveals the invariant intensive magnitude involved, and is valid for any scale of any octave.

It is in the direction of these Forms of things that our measurements and the resulting mathematicals should draw the mind if it is to attain knowledge. Here the mind has arrived at the exact, universal, intelligible being of the phenomena; it expresses the unity and eternal *logos*, which, as we should expect from Plato's description, is entirely suprasensible, and accessible to the understanding alone—yet it is embodied in the flux of shadows and imparts to these actual existences whatever they have of real being, in the midst of their becoming.

In retrospect we can now trace three levels in our dialectical ascent from things to ideas: (1) passing from the things to the additive properties involved; (2) the proportion expressing the intensive magnitude, which determines a functional interdependency between the quantitative magnitudes; (3) arriving at the universal Form or Idea embodied in that specific proportion. These, then, are three of the meanings which may be given to Galileo's dictum regarding measurement, or the determination of the indeterminate by means of the two principles, the πέρας and ἄπειρον. And although the indeterminate sense-qualities had to be reduced to quantities before they could be measured, yet we see that there is much more involved than the mere approximation to

'bare qua ıtities', namely, the discovery of an intensive magnitude, involving a Form which also had specific properties and qualities, though they were suprasensible and therefore quite different from those given by sensations. It now becomes clear that these levels correspond to Plato's account of the dialectical process illustrated by the figure of the divided line and the allegory of the cave in the *Republic*, and that there is still a fourth step before the process is completed, namely a grasp of the Idea of the Good.

Also corresponding to our three levels of measurement we find three levels of meaning of the measures of music. In the first place, we are to understand the heard harmonies; but the mathematicals of the second step also possess their own special kind of harmony, and certain kinds of proportions involve a term called the harmonic mean. Finally, the Form or Idea is an example of that intelligible harmony which delights the mind just as the sensed harmony is pleasing to the ear; here we have not merely μέτρον but σύμμετρον, not only metrics but symmetry. Thus music, like all substantives, is a highly rhetorical term, and we become entangled in many difficulties if we insist on limiting such terms to their concrete, literal meaning. For instance, rational communication between persons or nations becomes difficult if both use the same terms but intend different levels of meaning by them, or the same situation may occur in the interpretation of a scientific or political event, leading to misunderstanding or perhaps even strife.

This last kind of symmetry may be stated in its most general form as follows. Let there be a system S_1 containing two or more elements, such as the numbers 6, 8, 9, 12, between which certain fundamental relations R, R′ . . . hold. In a second system S_2 containing elements of quite a different nature, such as the four string-lengths, we may discover that certain fundamental relations hold which on the surface seem not at all similar to the first set, but which have the same general form, R, R′. . . . It is then possible according to a rule to place each element of S_1 in a one-to-one correspondence with each element of S_2, in such a way that to those elements in S_1 between which the relations R, R′ . . . hold, there are paired elements of S_2 between which the similar relations obtain in the domain of S_2. In such a case the two domains of interpretation are isomorphic, *i.e.*, they both embody the same Form

or Idea, and the pairing represents an isomorphic mapping of S_1 on S_2.[3] Thus we see that the Platonic measurement in our example involved the isomorphic mapping of a select system of four numbers upon another system whose elements were the four strings of the lyre. This aided the mind in "recollecting", to use a Platonic term, the common intelligible Form or Idea embodied in both systems. This seems to be an account of how our scientific knowledge increases, and also explains why it seems to advance often by a sudden leap after a period of relative quietude; someone gains an insight into a new isomorphic mapping, and a new domain of interpretation is rendered intelligible. Its advantage lies in this: one of the systems in the mapping represents a set of general conditions (usually mathematical) which is more completely understood than the second system; but if just enough of the relations holding in the second system are discovered to establish the mapping, then the second domain of interpretation gains all the intelligibility which was hitherto confined to the first. Or in Whitehead's terms, "reason insists on the admission that, if any entities whatever have any relations which satisfy such-and-such purely abstract conditions, then they must have other relations which satisfy other purely abstract conditions; *i.e.*, provided we know something which is perfectly general about the elements in any occasion, we can then know an indefinite number of other equally general concepts which must also be exemplified in that same occasion".[4] Thus Descartes established such a one-to-one correspondence between the elements and relations of the two systems of Euclidean geometry and algebra, respectively, to discover analytic geometry; Newton was able, after discovering the calculus which enabled him to treat curved lines as straight ones, to discover an isomorphic mapping between the terrestrial mechanics of Galileo and Kepler's geometrical laws of celestial motion, which resulted in his mechanics of our solar system.

If measurement be considered from this Platonic point of view as an isomorphic mapping which leads to an insight into the intelligible form embodied in the shadows of experience, perhaps we have a general instrument of analysis which can be effective even in the domains of interpretation of the thorny fields of the so called

[3] *Cf.* Weyl, *Philos der Math. u. Naturwissenschaft* # 4.
[4] *Science and the Modern World* 33, 40.

social sciences, where a concrete literal interpretation of Galileo's dictum has led to such ineffectual results. An example of such measurement is actually at hand in Plato's analysis of Justice in the third and fourth books of the *Republic*. We may take our cue from the previous example of measurement in the case of music, for we find Socrates throughout the dialogue insisting that harmony is a property of the just state and the just individual. So, if the proper level of interpretation be attained, we may expect to find that justice is a kind of harmony, while the harmony of our lyre in turn also embodies something of the essential nature of justice. Regarded from this point of view, Plato's expurgation of Homer and his criticism of the Greek musical modes is no longer the ruthless obscurantist censorship of the 'enemy of the poets', as some interpreters seem to suppose; but is an intelligible plan for education in the State. Plato found that the measured lines of Homer's poetry and the various Greek musical modes possessed harmony in a limited sense only; they must both be tested in terms of that harmony which is akin to Justice, "for a young person cannot judge what is allegorical and what is literal" (378E).

It remains then to differentiate the indeterminate domain of interpretation which is justice, in order to expand the levels of interpretation. Here, again, we find two systems, the State and the Individual. In the first, Plato analyses out as elements the three abstract classes of functions in the State, namely Rulers, Warriors and Artisans, for which there hold the properties or relations of Wisdom, Courage and Temperance, respectively. In the second system, *i.e.*, the Individual, we find as elements the three abstract classes of functions of the Individual, namely, Understanding, Will, Appetite; and we find further that precisely the same relations obtain between the terms in this system as in the first. Hence the elements of the two systems can be placed in a one-to-one correspondence, and the isomorphic mapping is established.

STATE	(Rulers	Warriors	Artisans)
	Wisdom	Courage	Temperance
INDIVIDUAL	(Understanding	Will	Appetite)

Justice is the common intelligible Form or Idea embodied in both systems when so organized that every individual "has bound to-

gether the three principles within him, which may be compared to the higher, lower and middle notes of the scale, and the intermediate intervals—when he has bound all these together, and is no longer many, but has become one entirely temperate and perfectly adjusted nature, then he proceeds to act, . . . always thinking and calling that which preserves and cooperates with that harmonious condition, just and good action, and the knowledge which presides over it, wisdom; and that which . . . impairs that condition he will call unjust action, and the opinion which presides over it ignorance" (443E). Here again we have a single universal Form which is embodied in three levels of interpretation: justice first as the concrete act of each citizen "doing his own business and not another's whether in ruling or in being ruled", secondly as the harmonious subordination and superordination of the elements of the State and Individual, and thirdly as the Form or Idea embodied in this proportionality of ordered relationships. "This is the only virtue which remains in the state when other virtues of temperance and courage and wisdom are abstracted; and this is the ultimate cause and condition of the existence of all of them, and while remaining in them is also their preservation; and we were saying that if the three were discovered by us, Justice would be the fourth" (433C).

When this intelligible form has once been grasped, it becomes effective as the πέρας or principle of differentiation in the dialectical analysis and expansion of other, as yet undifferentiated domains of interpretation, which may clarify certain more specific problems in connection with the state. Let us once more establish an isomorphic mapping, this time taking as an example of the domain of interpretation the problem of education in the State, to see if it can be so organized as to embody the form of Justice and Harmony. This domain may also be differentiated into a third system, containing three elements. The first step in educating the citizens of the State is gymnastics, which in its broadest sense means training the body so that it is skillful in performing useful operations of production; at this level we are concerned with the arts and crafts. The characteristic property or relation it teaches is temperance and due measure or efficient coördination of the muscles and bodily activities. It is not difficult to find its corre-

sponding element in the first two systems, the State and the Individual; gymnastics has for its end the perfection of the artisans' function. Secondly comes a study of music, which meant literally a study of Homer as well as of the musical modes. Here we pass beyond mere operations, and a certain insight into forms is demanded, perhaps a knowledge of at least the second level of interpretation of harmony. "Neither we nor our guardians whom we have to educate, can ever become musical until we and they know the essential forms of temperance, courage, liberality, magnificence, and their kindred, as well as the contrary forms, in all their combinations, and can recognize them and their images wherever they are found . . . believing them all to be within the sphere of one art and study" (402C). Homer is a heroic poem, and the accepted Dorian and Phrygian modes are of a martial character, so it is fitting that that element should have courage, which is defined as *knowledge* of what is to be feared and what not to be feared, as its characteristic relation, and the perfection of the warrior function as its end. Finally, the third element is Dialectic, which should lead the mind not only to grasp the intelligible Forms in their final clarity, to know the Ideas of Justice, Harmony and the rest with their relations in the third and fourth levels of interpretation, but also even to be able to gaze upon the sun himself, which is like unto the Idea of the Good, the author of all being and knowledge. This element can have no other characteristic relation than Wisdom, nor any other end than the perfection of the Ruler's function, the Philosopher King. We have thereby completed the isomorphic mapping of system three on the other two, differentiated out the three levels of meaning for the term Education, and found it also to embody the Form of Justice.

It is interesting to note in passing that one of the elements in a system may in turn be taken as a sub-domain for further differentiation and dialectical expansion of levels of meaning in terms of the same general Form. Thus, for example, Dialectic itself is found to contain the three elements Arithmetic, Geometry, and Astronomy, having the same characteristic relations which are common to all the previous systems, only in this connection their third level of interpretation applies. Thus again these elements can

be placed in a one-to-one correspondence with those of S_3 and the others; and we find that this sub-system is homomorphous with the original one, thus exhibiting again the Form of Justice, which seems to be everywhere present.

This process of measurement, of differentiating the undifferentiated domains of interpretation on the basis of our two principles, the πέρας and ἄπειρον, can go on indefinitely, checking, correcting, and revealing ever more clearly the intelligible form involved. It should be noted that from this point of view the entities to be measured are not given as such in the direct sense-experience of plain observation, as naïve empiricism would have it. Rather, naïve experience differentiates the domain of interpretation into shadows on the basis of ἡδονή, pleasure, not ἐπιστήμη, knowledge, which can never result in the real essence of the entities, but at best only in a doubtful opinion, which is certainly not what Plato meant by knowledge. On the contrary, the real entities are not simply given, but are generated out of the given ἄπειρον, so to speak, by the process of differentiating the hitherto relatively unanalysed domain of interpretation, as shown in our examples. Thus the objects of a science come into being for knowledge as the result of the intelligible Form, and are therefore no mere shadows, but real scientific objects. This is the process of "generation into essence" described in the *Philebus*. It may be objected that since the Platonic process can go on indefinitely without exhausting the continuum of the ἄπειρον, the object of our measurement is never exactly grasped by knowledge. But for our most exact modern physics the single element appears only on the horizon as the limiting idea to which an approximation is made as nearly as is desired. Besides, it is not the isolated object from which science begins, but the domain of interpretation, in order to arrive at a systematic schema in which each object arises as the result of analysis, and has its assigned place in relation to the others.

In conclusion we see that Plato's theory of measurement is essentially mathematical in its form, but mathematical in the third or dialectical level of interpretation. It is more than mathematical if we arbitrarily restrict our meaning of that term to the category of quantity, to its additive aspect. It is true that his theory finds its ideal embodiment in particular systems of mathematics such as

the natural-number series and elementary geometry, yet it also insists on attaining a level of Form which is universal enough to preserve its mathematical character and essence, and also to apply to domains and their elements not analysable in terms of the more specific mathematical instruments, so as to differentiate them into systems embodying and revealing their own intelligible Form. Looking back at that interpretation of Galileo's dictum which arbitrarily restricts measurements to a set of operations, we can now see that it is analogous to that level of meaning called gymnastics, which deals with skilled activities—an important and necessary function, but worthy more of the artisan than of the ruler.

Seen from this point of view perhaps Plato has indicated how we can set about to follow the dictate of Galileo, to "measure all that is measurable", with some insight into what is involved in the task of interpreting our oracle. And in addition we may be prepared to carry out more fully the command to "render measurable whatever as yet is not" in fields which previously refused to submit to analysis even in terms of numbers, because their formal properties, such as the Justice and Harmony embodied in them, were not understood.

LEWIS M. HAMMOND

UNIVERSITY OF VIRGINIA

THE LOGIC OF RELATIVITY

TO APPLY the mathematical theory of invariants to the study of logical problems, and to sketch the possible advance in depth and clarity that logic may gain through it, is the purpose of this article. It is my contention here that mathematical or physical relativity is only a special case of a more universal situation which may properly be termed the general relativity of logical groups. Relativity is a property, or rather a manifestation, not merely of our measuring processes, as is held by the physicists, but of all our thinking processes (measuring being only a special case of thinking). It is a direct result of the structure of ideas, rather than of nature, and may therefore be profitably utilized as a key to the mechanism of thinking.

The existence of logical matrices. It is customary to regard 'ideas' either as immutable entities each representing a single value wholly determined by its fixed location in the realm of logical forms, or as changeable fragments of human mentality, subject to growth and evolution, as transient and fickle as human nature itself. In other words—to use a mathematical analogy—'ideas' are commonly treated as either constants or variables. This appears to be a perfect disjunction; a *tertium non datur.* And yet the theory of relativity, if extended to logical matters, seems to suggest that 'ideas', *i.e.,* logical units used in thinking, whatever they are in their essence, in their function are neither constants nor variables. For they are not single entities. They are sets or groups, roughly speaking, collections, something in the nature of an algebraic matrix, or—more precisely perhaps—a vector. For they are expressions of a certain intrinsic invariance within a given group of logical transformations. *Idea* is really a plural, not a singular. Like *army,* or *array,* it is a collective term. And this—it must be emphasized from the outset—not merely in the sense that every idea represents a collection of attributes, but in the sense that the whole totality of attributes constituting a given concept is merely a relative manifestation of the content of the idea underlying it, just as 'distance' in a four-dimensial continuum is different with respect to different frames of reference. *Idea* has many meanings. And this, again, not because 'we' as conscious and active beings are often

compelled to assign different meanings to the same word; such an interpretation of logical relativity is precisely what I endeavor to combat; it would render my position hopelessly relativistic. The multiplicity of meaning which the theory of relativity suggests is not a psychological affair. It is inherent in the meaning itself as an objective phenomenon. Relativity holds no matter what interpretation we shall choose to adopt with regard to the nature and substance of ideas; we may choose to regard them as mental facts, or biological adaptations, or even neutral entities with all the Platonic implications that are suggested by the neo-phenomenological petword *Geltung*. The multiplicity and relativity of meaning holds true as a purely logical fact entirely independent of our metaphysical or even epistemological views. It is a strictly descriptive phenomenon.

It belongs to the essence of the individual to have a 'face'. Ideas are not individuals. Every idea has a multitude of 'faces'; it confronts the world in a number of ways. Its 'face' depends upon the mirror in which it is reflected, *i.e.*, upon the context in which it is defined. An idea can never be fully defined, or even described, in a single manner. Its complete determination would be an integral of all possible descriptions, each in itself wholly complete—a determination which is far beyond our intellectual capacity. Of all possible manifestations or definitions of an idea we usually possess a very small number. The rest are vacant places, prospective solutions, or rather problems in transformation. It is for this reason that our ideas, like atoms, consist largely of emptiness. Our logical determinants contain mostly zeros. Only here and there sparingly scattered over the matrix of the logical determinant we find something approaching a real value different from a question-mark and not vanishing to zero. Such values, known as 'definitions', are difficult to obtain in a satisfactory manner. They are expressions of the idea in question with respect to a properly, and profitably, selected frame of reference. We shall call such expressions 'concepts'.

The introduction of a frame of reference. The selection of a frame of reference, or convenient system of logical coördinates, is a necessary condition of any expression of ideas. Idea does not mean anything to us unless it is expressed in concepts. And in order to express it in concepts some reference-frame must be employed.

With respect to different frames of reference the same idea shows different, often irrecognizable, faces. Their logical expressions depend essentially upon the choice of logical coördinates, *i.e.*, upon the set of fundamental notions in terms of which the definitions are framed.

It is in this sense that we regard our ideas as fundamentally relative. Not in the sense of 'contextual monism', which maintains that the context is virtually a part of the meaning of a given idea, and is directly contained by it; nor in the sense of philosophical relativism, which holds that ideas change from generation to generation, and from man to man. They are relative in a far more fundamental and radical sense. For they objectively and ontologically *mean* nothing except relatively to an arbitrarily chosen point of view. And there is always a multitude of possible, and a still larger number of impossible, points of view. None of them guarantees absolute truth. None can be singled out for special distinction. But each concept contributes something to our knowledge of the whole set which we call idea. And only by a peculiar process of combining the results obtained within every single reference-frame, *i.e.*, by integration, do we arrive at what we commonly call 'truth'.

Aristotelian and non-Aristotelian logic. Our conventional logical rules—syllogisms, definitions, etc.—are largely confined to conceptual operations. The traditional, Aristotelian logic is a logic of concepts. This, I think, is the main reason why logicians are seldom satisfied with its precepts and its results. The real thinking only begins where the Aristotelian logic ends. It begins with the transformation and coördination of concepts. It consists of operations, not with individual concepts, but with groups and matrices.

The logic of matrices is fundamentally non-Aristotelian in its very nature. The processes of integration do not fit into the narrow limits of syllogistic forms. They are not subject to rigid rules. Their results—ideas—are not fixed entities, but groups of variables; and therefore do not strictly follow the laws of contradiction or of the excluded middle. It is for this reason chiefly that they cannot claim to be conveniently 'clear' and 'distinct'. Clearness and distinctness are properties of the concepts. Ideas are seldom, perhaps never, clear. They may be profound or shallow,

adequate or inadequate, rich or empty; but clearness is not their virtue. Concepts are clear and distinct—in proportion as they are unreal. But ideas cannot be called clear for the same reason for which a number or an army cannot be called clear; the property of clearness has here no meaning.

This does not mean, however, that Descartes' precepts are no longer valid. Descartes does not deal with ideas, in the sense in which the term is here used. What he calls ideas are really concepts. And concepts must, indeed, be clear and distinct to provide material for the formulation of ideas. The existence of non-Aristotelian logic does not invalidate the laws and rules of the Aristotelian code, just as non-Euclidian geometry does no harm to the Euclidian system.

The Aristotelian doctrine of definition. Aristotle believed that two different definitions of the same thing are impossible (πλείους οὐκ ἐνδέχεται ὁρισμοὺς εἶναι). For a definition, according to his doctrine, is a proposition signifying a thing's essence. And a thing can "evidently" have only one essence. In this sense true definitions are "absolute" (τὸ ἁπλῶς), *i.e.*, only one definition of each thing is possible, and this one excludes all others as false. Let me now demonstrate that this doctrine does not hold.

Logical variables. 'Man' has been variously defined as a 'rational animal', 'featherless biped', 'pithecanthropus erectus', 'time-binding animal', 'living image of God', 'Son of God', 'political animal', 'maker of history', etc. The formal logician will probably object to defining 'man' as 'Son of God' on the ground that the definition is vague and figurative. But for the theologian it locates 'man' precisely. On the other hand, the definition commonly considered valid among logicians—'man is a rational animal'—means absolutely nothing to the biologist. Not one of the above definitions, I believe, is absolutely faultless; but none can be said to have an absolute advantage over all others. Each is relatively valid within its own field. That is, each serves the purpose of identifying 'man' with respect to some system of logical coördinates. But the identifying labels are different, and often even unintelligible in terms of each other.

Another illustration. 'Straight line' can be defined as the 'shortest path between two points', or as an 'entity in space which is com-

pletely determined by two points', or as a 'geodesic on a flat surface', or as a 'curve whose tangency at every point is of the second order'. Given a system of rectangular coördinates in a plane, a straight line is defined by the equation $ax + by + c = 0$, which allows an unlimited number of transformations into other coördinate systems. What, then, do we mean when we say 'straight line'?

The question has no meaning unless we specify the circumstances under which the definition takes place. 'Straight line' is not a logical constant. It means different things under different logical circumstances. That is, its meaning varies according to the context in which it stands.

The above illustrations clearly show that logical terms, whether relative (in the traditional sense in which 'father' is a relative term) or not, are variables, not constants. But they are variables in a very specific sense. In what sense?

Two kinds of mathematical variability. There are two distinct kinds of variability in mathematics. An x may be regarded as 'variable' when it is allowed to assume different numerical values within a process of change. Thus in the customary notation of analytical geometry x represents any numerical value between $-\infty$ and $+\infty$ that may be assigned to the abscissae of a moving point. Every letter used in algebra represents *any one* of a certain class of elements, and is in this sense a variable. On the other hand all the values of x from $-\infty$ to $+\infty$ may be simultaneously altered by the application of a new system of coördinates. All values of x can be transformed into x', as, for example, when rectangular coördinates are changed to polar coördinates. In the first case x is identified with any one of the series of values: x_1, x_2, x_3, . . . which x is allowed to take in the process of change. In the second case x represents the whole collection of values which are transcribed into a new set x', which in turn may be transcribed into another set: x'', etc. In this latter case x is in all its values identified with a series of transformations: x', x'', x''', . . . This is a series of series, a set of sets, not a set of individual values. The whole process of change, *i.e.*, the entire set of values $x_1, x_2, \ldots$ *as a whole*, is now referred to a different frame, and assumes a different form, such as $x'_1, x'_2, x'_3, \ldots$. All x's become x-primes.

All x-primes may, in turn, become x-seconds, such as x''_1, x''_2, ... My monthly income, for example, with all its fluctuations may be expressed in dollars (x), francs (x'), roubles (x''), etc.; just as the general equation of parabola can be expressed in rectangular, homogeneous, polar, or any other system of coördinates. Thus the first kind of variability, *i.e.*, when x assumes different values usually causing some other variable y to change, is concerned with individual values; and its process may be discontinuous or continuous. The second kind of variability—expressed by transformations—is in the vast majority of cases concerned with sets or groups of values, changing all the individuals constituting a set simultaneously and discontinuously. It is something in the nature of a mutation.

To express the second type of variability, *i.e.*, when x in all its values is transformed to another system of coördinates, the term 'variant' may be proposed as distinct from 'variable' and opposed to 'invariant'. The difference between the two types of variability, *i.e.*, between variables and variants is so obvious that —for the mathematician—there is no danger whatever of confusing them. But the term 'variable' originally employed in mathematics has found wide application in scientific and philosophic literature; and there it is not always clear just what kind of variability is meant in each particular case. Logicians for example, often speak of variables when they really have variants in mind, and *vice versa*.

Invariants. It is in connection with the second type of variability that the term 'invariant' arises, and only in this connection has it its precise mathematical meaning. Algebra teaches us that the 'form' of an algebraic expression can often be changed or 'transformed' in various ways without altering the numerical value of the expression when numbers are substituted for letters. Thus—to use the most elementary illustration—the expression $a_2 + 2ab + b^2$ can be written in what is sometimes called logarithmic form $(a + b)^2$; similarly $a^2 - b^2 = (a + b)(a - b)$. The peculiar feature about these expressions is that they remain numerical identities for any values of a and b.

In dealing with algebraic equations we often face the problem of replacing x and y with a pair of other variables, x' and y', some-

how related to the original ones. Consider the expression: $ax^2 + 2bxy + cy^2$. Suppose it represents my investments in bonds, x, and stocks, y, estimated in dollars; and suppose I wish to convert it into pounds. In the process of transformation, not merely x and y, but also their coefficients, a, b, and c assume new values. Yet certain combinations of the coefficients remain unaltered under the transformation. It was discovered by Boole in 1841 that the so called discriminant of the expression $ax^2 + 2bxy + cy^2$ (that is, the combination $ac - b^2$) remains relatively invariant with respect to linear transformations. We say that the expression $ac - b^2$ remains relatively invariant under linear transformation. We do not mean, however, that a, b, and c are individually invariant, or constant. It is only in combination, and only with respect to certain operations (linear transformation), that they happen to balance each other. Some combinations of coefficients emerge from the transformation absolutely unchanged. They are then called absolute invariants.

We thus come to the following definition of an algebraic invariant. If we have a system of polynomials in the variables x, y, . . . , and a set of transformations of these variables, then any function of the coefficients of the polynomials is called invariant with regard to these transformations which is unchanged when the polynomials are subjected to these transformations.

Geometrical invariants. The notion of algebraic invariance has historically originated in connection with the problem of the transformation of coördinates. Many problems of geometry call for the operation of transformation. For geometrical relations which have a very complicated form with respect to one frame of reference (for example, rectangular coördinates) may suddenly acquire a very simple and elegant form with reference to some other frame (say, polar coördinates), and *vice versa*. Among all possible transformations two groups are particularly important: parallel displacement (*i.e.*, change of origin) and rotation of axes. Those are called linear transformations. With respect to linear transformations, which define free movements of figures in space without deformation, innumerable properties of figures remain invariant. Such properties are called geometric properties. Geometry is nothing else but the study of invariant relations in space.

The method of reducing geometry to the study of invariants we first find introduced by Grassman in his *Ausdehnungslehre*. He devised a method by which geometrical relations could be expressed in form of determinants which greatly facilitate the discovery, and the expression, of invariant properties in the most general form. Reference to figures becomes unnecessary, and the number of coördinates in the formulae entirely irrelevant. Grassmann's results are true no matter how many rows and columns his determinants may have, and therefore applicable to extensive media of any number of dimensions. In the majority of cases we cannot vizualize or picture his results; and that is partly, I think, what makes the perusal of his *Ausdehnungslehre* such a difficult matter. But we know that, if we had suddenly acquired the intellectual power to contemplate a four- or five-dimensional continuum, we should find his discoveries corroborated, and the relations predicted actually taking place.

Logical invariants. From the logical point of view an 'invariant' may be described as a structure which different sets of variables have in common, and which therefore controls their transformation from one to another. Indeed, 'invariance' has—logically—no meaning unless something is assumed, or postulated, which is independent of our operations of transformation. If I have a thousand dollars, I can express it in francs, marks, pounds, or roubles; I can adopt or devise any monetary unit. But the 'amount of money'—under normal conditions—is not affected by those transformations. We usually say that a thousand dollars is a thousand dollars whether we take them to England or France. It is evident to any unprejudiced mind that reference to dollars to indicate the invariance of the 'amount' is merely a matter of habit. The Englishman will think of the same 'amount' in terms of pounds or guineas. But it is a tacit assumption in both cases that there is something—in our everyday language we call it the 'amount of money'—which remains unaltered by the transformations. Just what it is, is not so easy to say. It can obviously be neither dollars nor pounds. Economists vary widely in their definition of this 'something'. But it is fairly evident that without it there would be no meaning in our transactions. Exchange as a kind of transformation would cease to exist, were there no economic factor which

remained 'the same'. This factor may be a mere figment of our imagination, a mere economic postulate. Then our transactions are also purely subjective. But at least as a postulate it must be there. For otherwise the word 'exchange' would be a mere meaningless sound.

Now dollars, francs, roubles, etc., are 'variants', not just 'variables' in the elementary sense; whereas the 'amount of money' involved in the transaction is something in the nature of an 'invariant'. At the same time it is something fundamentally more real and objective than the relative and, therefore, more ephemeral dollars, francs, etc. Thus on the basis of pure mathematics we arrive at a somewhat Platonized conception of reality, which agrees entirely with the results of modern physics.

Fundamental generalization. The transformation of coördinates in geometry and the change of variables in algebra are special cases of a more general logical operation of referring a rationally definable situation to two, or more, different frames, *i.e.*, of regarding the situation with respect to different contexts of discourse. By 'context of discourse' I do not mean any possible proposition, or 'text', in which the situation in question may occur or be mentioned, but one in which, or by means of which, it can be properly defined, or at least described. Thus the 'lungs' can be defined with respect to their purpose as organs of respiration; with respect to their function as mechanisms for taking oxygen and discharging carbon dioxide; with respect to their structure as a series of passages traversed by the air, which terminate in two very complex sacs projecting freely into the cavity of the thorax; etc. Here purpose, function, structure, etc., are contexts of discourse, or—as I prefer to call them to avoid misleading historical associations—different systems of logical coördinates. We shall, therefore, define logical coördinates as the contextual frame of reference (explicit or implicit) *which sustains a given definition.*

Concepts and ideas. We have distinguished between logical contents which are relative to their respective frames of reference and are, therefore, variable (in the sense of variants), which we shall call concepts; and the invariant factor which controls the process of transformation from one frame of reference to another, which I have designated as idea. Concepts are, if not exactly obtained, at

least rigorously formulated by a logical process called definition. Ideas on the other hand can never be learned by definition, even though strictly speaking it is precisely the idea, not the concept, which is defined.

The distinction between concepts and ideas, whether terminologically justified or not, is nevertheless real and genuine. I may be wrong in selecting these particular words to designate the difference. But the distinction itself, whether correctly described by this terminology or not, is a logical *fact*. We must distinguish between a logical or rational definition of what a given term means, which is always relative to some particular system of logical coördinates and is, therefore, fundamentally multiple and logically variable; and the total, or integral, idea of the term which remains invariant for all transformations. The following consideration may clarify the distinction.

It will be observed that defining concepts can rarely be employed in place of the terms defined. This is a rather paradoxical phenomenon which shows that we hardly ever use words precisely in the sense in which we define them. For we define *concepts*—or at least we commonly believe that we define concepts. But in actual thinking we inevitably employ *ideas*. 'Man' and 'rational animal' are supposed to be logically equivalent. But to say that 'this rational animal is hungry' is either an expression of sarcasm or else a sheer nonsense. In any event it means something else than what is meant by the statement 'this man is hungry'. To inform my friend that this man had dinner with me is quite proper. But to remark that this featherless biped had dined with me might under circumstances be very insulting. But why? Is it just because we are unaccustomed to hear such expressions? Do they seem grammatically strange? Hardly that. The strangeness that we instinctively feel in such cases is not of a verbal, but of a strictly logical nature. It extends to all situations of the same character. If we define 'S is MN', we cannot substitute MN for S in either speaking or actual thinking. The two remain logically distinct and different despite their identification by the judgment. "Duncan is in his grave", Macbeth reflects, anxious to pacify his disturbed mind (III, 2, 22). Suppose I substitute for 'grave' its definition from the Oxford Dictionary. Duncan, then, will be con-

fined to what the Dictionary calls "an excavation in the earth for the reception of a corpse". The absurdity of substitution is evident.

This absurdity is not linguistic. It is logical. 'This man is hungry' and 'this rational animal is hungry' are two logically different statements. For 'man' is a term that stands for a set of definitions. It is a matrix. Whereas 'rational animal' is just one member of this set. The fact that linguistically we employ the same name for 'featherless biped' and for 'rational animal' has a very profound significance; but should not be interpreted to mean that the two concepts are identical. 'Man' as expressed in its definitions is a variable entity which is open to an infinite variety of shades of meaning. Each meaning constitutes a concept which indicates a set of properties such as 'rationality' and 'animal life'. In its integral signification, however—we call it idea—'man' is the limit toward which this group of definitions tends when our experience concerning human nature approaches its prospective totality. Hence the idea is a set of sets. It is an expression of a infinite number of sets of properties, each set being associated with one of the infinite number of systems of logical coördinates.

What happens in the process of a transformation is a sudden and discontinuous change. The elements constituting a concept are not dropped, or added, one by one. They are changed all at once. Comparing for example two expressions, 'geodesic on a flat surface' and the 'shortest path between two points', we find no common elements in them. Logically they consist of different material. And yet they both mean precisely the same thing: 'straight line'. Neither of the two concepts is a part of the other. They are logically fully different. And yet they mean the same thing. The situation is radically different from, say, my immature and my advanced notion of 'differential', which—as concepts—are simply different, but not logically transformed. Hence transformation is not a subjective process determined by accidental changes in the point of view, but an objective logical occurrence determined by the intrinsic necessity of the situation itself.

Psychologically this suddenness is the characteristic feature of the situation. We usually 'understand' things quite suddenly. In solving a mathematical problem we may painfully work for hours

till we reach the point of complete mental exhaustion. Irritated and depressed we may go to see a moving picture or to attend a president's reception, as the case may be; and there in the midst of the emptiest conversation or silliest picture we often 'see' the solution all of a sudden. The shock of the unexpected is evidently reflected in the abstracted countenance that we happen to display at such moments, and for which we receive the reputation of being absent-minded. It is rather paradoxical that it is precisely at such moments of conspicuous absent-mindedness that we reveal the greatest evidence of mind, nay, perhaps the only occasion when we really *have* mind in the sense of active vision. Light usually comes upon us in a flash. In a fragment of a second, perhaps—who knows?—in no time, you comprehend the most complicated situation which in the logical form of successive steps, you feel, will take you months and even years to express. A novel, a play, a book stands clearly before your mind, and you *know* that it is merely a question of time before you express it in words. What you live through at such moments is what is commonly called inspiration, which in its root is nothing else but logical transformation.

Logical determinants. Let us return to the nature of concepts. A concept *if defined* cannot be regarded as a single series of attributes. For in a definition the specific difference is not simply added to the genus, but modifies all the constituent elements.[1] Therefore, the serial expression $(x, y, z, \ldots)$ is a very poor model for a concept. Definition renders every concept a two-dimensional group of elements. If we think of the totality of elements constituting 'animal' as a series $(a\ b\ c\ d\ \ldots)$, we must think of 'rationality' as giving a specific character to every one of them. Everything in a man is specifically human. Not merely has he a skull, but a unique skull; not merely does he propagate by sex, but has a very distinct sexual organization; not merely does he possess a pair of front paws, but he is in possession of a very remarkable apparatus, which we call 'hands', and which is perhaps more directly responsible for, or expressive of, his 'rationality' than even his brain; etc. Now suppose we represent 'skull' by *a*, 'sex' by *b*, front limbs by *c*, etc. If one wishes to describe human nature, one will have to describe each of these elements as specifically human,

[1] See my *Genus and Species*, this *Review* XXXIII (1929).

i.e., as completely modified by 'rationality'. Every element in itself is a series by virtue of definition. The concept 'rational animal', therefore, is a result of the logical coöperation of two series. This can be easily symbolized by a square matrix similar to those by which mathematicians represent algebraic determinants:

$$\mathrm{RA} = \begin{matrix} a_{11}\ a_{12}\ a_{13}\ldots a_1 \quad ..00.. \\ a_{21}\ a_{22}\ a_{33}\ldots..000000.. \\ a_{31}\ a_{32}\ a_{33}0000000000000 \\ \ldots\ldots\ldots\ldots\ldots\ldots \\ \ldots\ldots\ldots\ldots\ldots\ldots \\ a_1\ a_2\ a_3 \quad ..00000000000 \end{matrix}$$

This is a much more representative model of a concept RA than our traditional circles, or single rows of letters. A concept is not a single row of attributes. It is two-dimensional. I certainly would not propose to introduce this model into the elementary text-books on logic to illustrate the mechanism of syllogistic reasoning or the pitfalls of fallacies. It would be far too cumbersome. But I insist that it describes the structure of concepts more adequately than our conventional schemes.

The above model has another advantage. It can be written in a highly abbreviated form if we adopt the notation customary in tensor-analysis. A set of values $a_{\kappa\lambda\ldots\mu\nu}\ldots$ with n suffixes, each of which is allowed to take all numbers from 1 to m, is called a tensor of *nth* rank.[2] In particular $a_{\mu\nu}$, where μ and ν are allowed to take all values from 1 to n, stands for a set of n^2 quantities constituting a tensor of the second rank. It is to be noticed that $a_{\mu\nu}$ is not a single quantity; it is an abbreviated expression of an aggregate of quantities which can be all obtained in due order by first putting $\mu = 1$ and associating it with all the ν; then putting $\mu = 2$ and again associating it with all the ν; then $\mu = 3$, and so forth. Proceeding in this manner we shall reconstruct the above matrix RA. Therefore we can briefly write:

$$\mathrm{RA} = a_{\mu\nu}$$

This is our equation of 'concept'. We shall presently see that this formula is very useful and very convenient for describing the laws of logical transformation, and the structure of ideas.

[2] H. M. Turnbull, *The theory of Determinants, Matrices, and Invariants* 200.

The synthetic function. The determinant-shaped model of a concept may lead to the impression that I propose to regard concepts as aggregates actually constructed by adding terms into an arithmetical collection. This is not my contention. In fact, as I have shown elsewhere, every concept is a simple and indivisible unit. The model RA is not in vain called a determinant. For it merely determines, not constitutes, the value of the concept. It represents the material from which the concept arises, but is not to be identified with the concept itself, which is not a collection, but a synthetic function. In order to indicate the synthetic operation we shall place the letter i before the matrix $a_{\mu\nu}$. Our equation for 'concept' takes now the following form:

$$\text{RA} = ia_{\mu\nu} \tag{1}$$

In view of the fact that the theory of synthesis was originally elaborated by Kant, the function i may properly be called the 'Kantian function'.

An illustration. Before proceeding any further I should like for the sake of clarity to introduce another illustration, for which I am indebted to Professor G. F. Ferris of Stanford University. The class of insects designated by the entomologists as *anaplura,* and commonly known as lice, can be properly defined with respect to their structure as insects with incomplete metamorphosis, permanently wingless, with the segments of the thorax closely fused, notum suppressed, the apparent notum being formed by the plurites, the mouth-parts suctorial, the legs adapted to clinging to hairs. It is evident that the definition consists of a series of terms; $a_1, a_2, a_3, \ldots a_n, \ldots$ For the sake of the argument it is not required that the reader should understand the definition. It will be much more to the point if he does not. For then he will feel the necessity of expanding every term constituting the definition into an explanatory (vertical) series. Hence *anaplura* is symbolically reduced to the form:

$$\text{A} = \begin{matrix} a_{11}, a_{12}, a_{13}, \ldots . a_{1\nu}, \ldots \\ a_{21}, a_{22}, a_{23}, \ldots \ldots \ldots \\ a_{31}, a_{32}, a_{33}, \ldots \ldots \ldots \\ \ldots \ldots \ldots \ldots \ldots \\ \ldots \ldots \ldots \ldots \ldots \\ a_{\mu 1}\, a_{\mu 2}\, a_3, \ldots \ldots \ldots \end{matrix}$$

Here the first column ($a_{11}, a_{21}, a_{31}, \ldots$, or briefly $a_{\mu 1}$) stands for 'incomplete metamorphosis', the second column ($a_{\mu 2}$) for the 'absence of wings', $a_{\mu 3}$ for the morphological description of the thorax; etc. The whole definition ($A = ia_{\mu\nu}$) appears as a series of serial terms, as a two-dimensional matrix.

The equations of transformation. The above definition of *anaplura* was drawn from the systematist's point of view, and is valid only with respect to structure. The formula $A = ia_{\mu\nu}$ stands for a single equation, even though the righthand side of the equation represents a collection of terms under the synthetic function. It is now required to construct a formula for transformation.

Suppose we are asked to describe *anaplura* with respect to their style of life, *i.e.*, from the point of view of their behavior. We shall say that they are insects which live upon the bodies of various mammals sucking their blood, and attaching their eggs to the hair of the host. The description, again, locates the insects very precisely as pests, and may from the behavioristic point of view be regarded as equivalent to a definition. We can express it by writing $A = a'_{\alpha\beta}$, where α and β take all the values from 1 to m. Comparing this equation with the one that was obtained with respect to structure, and observing that the lefthand term, A, is identical in both, we have

$$(2) \qquad a_{\mu\nu} = ia_{\alpha\beta}$$

We interpret this equation as having the meaning that a's are transformed into a''s by means of $\alpha\beta$.

The equation (2) defines an invariant which we call 'idea'. In mathematics it is said that, if a function $a_{\mu\nu}$ of a's and another function $a'_{\alpha\beta}$ of a''s are such that they are reducible to one another by the equations of transformation of the variables, they define an invariant. In logic, however, we are not allowed to postulate existences with the same dictatorial facility with which mathematicians are allowed to proceed. And although our equations (2) were all obtained on the assumption that they are reducible to one another by the transformation of logical coördinates, yet the assumption itself must be tested for its validity. This we shall now proceed to do.

A Psychological proof of invariance. Kant believed that the

expression 'gold is a yellow metal' is an analytical proposition; that is, its predicate is a conceptual repetition in a clear and distinct form of what is vaguely contained in the subject. Can the difference between 'gold' and 'yellow metal' be adequately described by reference to the degree of clearness? Psychologically certainly not. When I hear the word 'gold' what I primarily find in my consciousness is the image of some particular things, such as my watch or an American twenty-dollar piece, of which gold is the material. That it is 'metal' is a chemical property which, in its specific meaning, is altogether too complex to be clear to the average person. Similarly, when I hear the word 'man' what I am directly conscious of is the familiar figure of the two-legged creature that I see daily in the streets. Psychologically it is entirely irrelevant whether this image is an abstract notion or a composite portrait. It might for that matter be a mere symbol. What I am convinced I do *not* have in my mind is any reference to either rationality or animals. Those are not even vaguely or indistinctly contained in my daily notion of humanity. Of course, I immediately agree with the definition as soon as I hear it on the basis of my experience. But I will with equal readiness agree to many other definitions of 'man'. They are all true; and in this sense—since truth, according to the common notion, must have a source and be located somewhere—they are all 'contained' in the subject. But it is fairly evident that such a localization is psychologically no more than a *façon de parler*. Moreover when the average person thinks of humanity he is likely to exclude, rather than to include, animal characteristics. It requires a certain amount of biological training to think of 'man' as a kind of animal, as a zoölogical species on a par with other members of the kingdom. As a matter of daily experience 'man' is incomparably more rich in content than the "clear and distinct" concept of 'rational animal'.

Similarly my notion of 'gold' is much richer than the chemical concept of 'yellow metal'. 'Gold' is to me a symbol of wealth. It is a great economic power, a source of international jealousies. By means of skillfully selected specific differences it can very definitely be located with respect to such genera as 'evil', 'power', 'value', 'elements', etc. That it is a 'metal' is a comparatively small,

and decidedly confused, item of my experience of gold. Therefore, psychologically the difference between 'gold' and 'yellow metal' should rather be described by reference to greater or less complexity, than by such misleading categories as clearness and distinctness. I am not a chemist. But neither was Kant. And I am convinced that for both of us the symbol 'gold' is much more clear and distinct than the real scientific meaning of the word 'metal'.

The crucial point of my present argument is that 'gold' and 'man' are psychologically, *i.e.*, in point of personal experience, more significant and eventful than the poor and pale definitions of their nature. The terms are depositories of experience. They denote something that can never be expressed by a single logical value; nor indeed by any amount of accumulated rationalistic cash. Even though they are repositories of experience, they should never be compared to a storeroom, not even to one of unlimited capacity. If comparison need be, we should rather regard them as resembling a banking organization whose actual operations by far exceed any amount of cash at hand.

A characteristic feature of any such repository—think of 'man' or 'gold'—rests upon the peculiarities of its constitution, *i.e.*, upon the way it is represented to us in experience. Every bank-note, to continue the comparison, represents the whole organization, and not merely a certain amount of cash. The organization functions as a whole in every particular transaction of its board. Similarly, in every particular situation of my personal life in which 'man' appears as an ingredient—the situation may be in the nature of a contact with, or judgment about, or conduct toward, a fellow man—the term is actually meant as an integral, and not as an individual concept *as defined*. To be sure, if I am invited to a dance, even though it be given by a group of college professors, I do not expect to be dancing with either 'featherless bipeds', nor with 'colonies of colloids', nor even with 'rational animals', but plainly and simply with concrete representatives of the fair sex, that is, with human beings. Any definition, or even description, however full and scientific, and immaculately correct, will positively ruin all my fun by changing my dancing partner into a ghost of logical pedantry. Hence, if I wish to maintain any sort of intelligible

contact with my fellow men, I should not be, and I cannot be, logically precise as to what I mean by 'fellow men', *i.e.*, what sort of definition I give to these words. Because, whatever the definition, in my actions toward my fellow men, as well as in my thinking about them, I shall be immediately obliged to overstep the boundary-line of any such definition, however perfect, and establish a relationship to something beyond.

This 'beyond', however, is not allowed to be a transcendent mystical quality. If it is at all within my reach, it must be somehow represented in my experience. There is no way to represent anything in experience except by representation, *i.e.*, concepts, which are of necessity relative to the frame of reference employed at the moment. My 'beyond', therefore, must consist of other representations, or concepts. That is, in maintaining my place in the world with respect to anything whatever, I am obliged to enter into relationship with *representative groups*, and not merely with individual concepts. Moreover, reference to groups constitutes the chief characteristic of our experience as experience. For individual concepts are not really experiences, but lifeless and senseless abstractions. They make sense only in so far as they are known to be members of a group. Without reference to groups we should be dancing with 'featherless bipeds' and dining with 'rational animals'. Hence the first part of the required proof: groups do actually occur in our experience and in thinking as reference-objects. It remains to show that such groups constitute units which possess the property of invariance.

Not every collection of individuals constitutes a group. Only those are regarded as constituting a group which are said in common language to define the same thing. Only, the thing is not given except by representations, *i.e.*, through the members of the group. It is not the thing which defines the group, but the group that determines the thing. Hence there must be something in the group that compels its members to stick together. In other words, there must be a reason for grouping. And this reason cannot be located in the 'thing', because the 'thing' is not there except as given, or represented, by the group. The group of concepts is the primary phenomenon which is directly known, and the thing is merely an assumption, the reason for which rests with the existence of the

group. The thing is entirely secondary, and in a way merely a *façon de parler*. It is largely a grammatical, not a logical, category.

The characteristic feature about the groups which are practically and logically valid is that their members are transformable into one another: 'rational animal' into 'pithecanthropus erectus', etc. We know that the transformations are not arbitrary. They are controlled by something beyond mere assumption. Like physical vectors, or tensors, the terms when transformed into a new coordinate system assume definite and strictly predetermined values. We are not free to transform them *ad libitum*. If we do, we commit an error, and we have to pay for it. This feeling of restraint, subordination, and control is what we experience as reality behind the concepts. We come to the old Parmenidian precept: reality is naught but necessity in thinking.

A logical proof of invariance. Let us, now, consider a set of propositions defining 'man'. The defining concepts are admittedly different in every definition, each concept, if it is at all valid, contributing something to the integral view of humanity. Beginning with the child's notion of 'man' as 'one who has legs, and arms, and face'—which is valid in so far as it is quite sufficient to identify the familiar figure that we see daily in the streets—the concept moves through a series of transformations. Since the conceptual material is different in each definition, it follows that the definition does not equalize the items thus transformed. 'Characteristic figure' remains 'characteristic figure', and is not identically equated to 'rational animal'. The meaning of the definition, M = RA, is not that the 'characteristic figure with arms, legs, etc.', *is* 'rational animal'; it could not be because our 'characteristic figure' is a concept with a very specific logical material into the composition of which only those properties are allowed to enter which make it different from 'animal'; for, as we know, everything in a man is specifically human. William Jennings Bryan was right in refusing to identify the creature that he saw in the streets and in the churches as an animal. Hence the meaning of the scholastic definition is, not that the 'characteristic figure' itself, but that something indicated by that 'characteristic figure', *i.e.*, 'man', is supposed to be 'rational animal'. But 'rational animal' also merely indicates 'man' without, for similar reasons, being identical with

it. Hence the transformation presupposes that both concepts indicate the same situation *which remains unaltered by the transformation.* Without this assumption definitions have no significance. Concepts acquire significance only with respect to prospective transformations.

I have stated the principles of logical relativity. A number of problems in philosophy will appear in a new light from this point of view. Let me now briefly sketch the field of possible applications.

The notion of 'resemblance'. Eddington writes as follows.[8]

> The physicist who explores nature conducts experiments. He handles material structures, sends rays of light . . . marks coincidences, and performs mathematical operations on the numbers which he obtains. His result is a physical quantity, which, he believes, stands for something in the condition of the world. In a sense this is true, for whatever is actually occurring in the outside world is only accessible to our knowledge in so far as it helps to determine the results of these experimental operations. But we must not suppose that a law obeyed by the physical quantity necessarily has its seat in the world-condition which that quantity 'stands for'. . . . Results of measurements are the subject-matter of physics; and the moral of the theory of relativity is that we can only comprehend what the physical quantities stand for if we first comprehend what they are.

What the physical quantities *are* is well illustrated by the example of vectors and tensors. They are mathematical concepts, or expressions which are relative to a given frame of reference. The common, three-dimensional vectors—as we know—are mathematically defined by three numbers, $x\ y\ z$, which are called the components of the vector, and which are relative to some arbitrarily chosen coördinate system. Those numbers are transformed according to a certain mathematical rule, so that $x\ y\ z$ of one system become $x'\ y'\ z'$ with respect to another. "In physics", Eddington continues, "we conceive that both quantities express some kind of condition or relation of the world, and this condition is *the same* whether expressed by $x\ y\ z$ or $b'\ y'\ z'$." In other words, a physical vector is a world-condition, a piece of reality, or 'idea', which is identified by the set of transformations associated with it. A world-condition cannot appear directly in a mathematical equation; only its measure can. But measure presupposes a measuring code, that is,

[8] *The Mathematical Theory of Relativity* 240.

a coördinate system with respect to which the measuring is performed. Measurings which were independent of any coördinate system would be a physical utopia. Hence for the physicist measure and measuring number has the same significance which 'concept' has for the logician. It is an expression of a world-condition manifested with respect to a given frame of reference. The world-condition itself is the physicist's equivalent of what we have called 'idea'. It is that something, "that vaguely conceived entity", which is indicated by the components of a vector or tensor, something the measuring-numbers "stand for".

This vaguely conceived something does not resemble any one of its relative expressions, nor do those expressions resemble it. The epistemological relation between the two is not even distantly analogous to that which obtains between picture and its original. Concepts do not imitate reality. Eddington explains the situation as follows:

> The parallax of a star is found by a well-known series of operations and calculations; the distance across the room is found by operations with tape-measure. Both parallax and distance are quantities manufactured by our operations; but for some reason we do not expect parallax to appear as a distinct element in the true picture of nature in the same way that distance does. Or again, instead of cutting short the astronomical calculations when we reach the parallax, we might go on to take the cube of the result, and obtain another manufactured quantity, a 'cubic parallax'. For some obscure reason we expect to see distance appearing plainly as a gulf in the true world-picture; parallax does not appear directly, though it can be exhibited as an angle by a comparatively simple construction; and cubic parallax is not in the picture at all. The physicist would say that he finds a length, and manufactures a cubic parallax; but it is only because he has inherited a preconceived theory of the world that he makes the distinction. We shall venture to challenge this distinction. Distance, parallax, cubic parallax have the same kind of potential existence even when the operations of measurement are not actually made. . . . Any one of the three is an indication to us of some existent condition or relation in the world outside us—a condition not created by our operations. But there seems no reason to conclude that this world-condition resembles distance more closely than it resembles parallax or cubic parallax. Indeed any notion of 'resemblance' between physical quantities and the world-conditions underlying them seems to be inappropriate.

It has been repeatedly pointed out by various philosophic writers that the notion of 'resemblance' between ideas and realities origi-

nates from the assumption that reality has a visual character, that it can be seen. Nothing illustrates the falsity of this assumption more forcibly than the physical theory of relativity. One may expect to see an atom, an electron, perhaps. But it is quite evident that neither tensors, nor invariants, nor even vectors for that matter, can ever be 'seen' or 'observed'. If one expects to 'see' a tensor or to 'hear' an invariant, he simply does not understand what he is talking about. Those are not of the order of visual relations. They are not single individual things. They are groups of transformations. To 'see' a tensor would imply the capacity, not merely to see its components, which would at least be intelligible, but also to see an infinite, or rather indefinite, multitude of all possible transformations of those components into all possible coördinate systems. For that is what a tensor is, a totality of transformations. It can never been seen, because there is nothing to be seen.

True is the ancient saying of Parmenides that reality can only be thought, but never sensed. In the light of the theory of relativity this slogan acquires a new significance. Reality can only be thought, not because it is revealed to us only by *a priori* constructions without any reference to sense-experience—this was an aberration of rationalism—but simply because, like vectors and tensors, it is a matter of transformation and logical integration, which are not sensory operations. Continued opposition to the Parmenidian principle in epistemology is based on a confusion. It is believed that the principle implies disregard of experience and a complete reliance upon 'pure reason'. In other words the opposition is methodological, and in so far it is fully justified. But the popular scientific epistemology goes too far in its eulogy of the senses. It is often believed, and still more frequently tacitly implied, that thought is a mere reflex of sensory experience, and is not in a position to contribute anything new, anything of original value to the body of knowledge. It is implied, and sometimes explicitly stated, that 'thought'—a term indiscriminately employed for both 'concepts' and 'ideas'—is nothing but a faint copy of experience. This would mean, to return to our original illustration with tensors and vectors, that a tensor, which is indubitably a 'thought', is a 'faint copy' of its own components. If that is the meaning of empiricism, then empiricism is a meaningless jumble of words.

No particular expression of a tensor[4] $g_{\mu\nu}$ with respect to a given coördinate system can be said to resemble the tensor more closely than any other expression, or to resemble it at all. In the equation of transformation

$$g_{\mu\nu} = \frac{\partial x_i}{\partial x_\mu} \frac{\partial x_j}{\partial x_\nu} g'_{ij}$$

neither the left nor the right side of the expression can be said to be a 'semblance', or 'picture', or 'copy', of the tensor; $g_{\mu\nu}$ just as well as g_{ij} is the tensor itself, the whole tensor, in so far as it is transformed into the coördinates-system, x'_1, x'_2, x'_3; any g is the whole tensor relatively conceived. Similarly 'rational animal' is the whole 'man', we say: it defines 'man'—with respect to a certain group of biological coördinates. The relation of 'resemblance' in this context means nothing. With regard to thinking processes it has no descriptive value whatsoever.

The problem of 'transcendence'. The principles of logical relativity throw a good deal of light upon the problem of 'transcendence'. If the relation of resemblance does not describe the nature of knowledge; if the concept does not resemble the reality it conceives, what is the connection between them? Is reality 'outside' or 'inside' the concept?

In my opinion, the relation between concept and reality has been best described by Plato as 'participation'. Our concepts do not 'resemble', do not 'imitate' reality. They actually and directly participate, and allow us to participate, in the life of reality. Reality is not a solid and immutable substance. But it is not a continuous flow or change either. It has no definite 'what' except relatively to a given frame of reference. But relatively defined every item of reality has innumerable what's. Some of those definitions, or concepts, may fall within the range of consciousness. Others—and these are, no doubt, in the majority—are transformations with respect to such contexts which are unknown, or even wholly unimaginable to us. For such regions Nicolai Hartmann has coined the term "trans-objective".

Reality, *i.e.*, idea, is always transcendent. For it stands for the

[4] The reader who is not familiar with tensor-analysis may without much loss of generality substitute the word 'vector' for 'tensor'. The argument will hold its force.

totality of transformations which is 'meant' or 'held in view', yet never directly experienced by consciousness. But certain portions of that totality can be directly experienced by conscious beings. They are exactly on a par with other portions of the same totality which are not, temporarily or ever, experienced by men. Those will be, temporarily or ever, trans-objective. But there is no difference in principle between the two. The trans-objective residuum is not to be conceived as an original archetype according to which the subjective concepts must be formed and transformed, or to which they must correspond in order to be true. Nor are the subjective portions 'copies' or 'images' of the trans-objective residuum. The subjective concept is just as much reality itself as its trans-objective counterpart on the 'outside'. Both are *variants* belonging to the same group. Reality (idea) is present in every one of its concepts fully and completely, just as a vector is fully and completely given by its three components. Every concept is a relative manifestation—a variant, not a copy—of reality within its own frame. In this sense, and only in this sense, reality is wholly immanent. On the other hand, no concept, being a relative manifestation of an idea, is an adequate expression of the reality. It is always transformable into innumerable other frames. The idea is never reached, but only—perhaps—touched by a concept in one of its points. In this sense ideas are wholly transcendent.

Thus the terms 'transcendent' and 'immanent' lose much of their poignant romance of hostility. They peacefully turn out to be two versions of the same story, or—more precisely—two variants of the same idea or reality of 'knowledge'. To discover the identity of the story behind the diversity of historical settings was the achievement of mysticism. There is a mystical factor (of immediacy) in every knowledge, even in the scientific knowledge of empirical facts and statistical tables; and science ought not to be ashamed of it. Knowledge is alienation and direct participation in the object known. In Campanella's immortal phrase: *scire est alienari et perdere proprium esse et acquirere alienum; ergo non est scire res, prout sunt, sed fieri res et alienatio.*

The problem of 'essence'. The logic of relativity helps to understand the classical concept of 'essence'. According to the classical view, essence manifests itself in every one of its appearances al-

ways as a whole. This is one of the standing paradoxes of philosophy which can never be solved as long as one remains within the limits of the Aristotelian logic of concepts. Essence is an 'idea', and must be approached from the point of view of the logic of matrices. Let us consider some historical concepts of 'essence', and see how simple they become in the light of the logic of relativity.

The crucial, and yet paradoxical point is that in every 'appearance' the 'essence' is somehow present, not partially, but as a whole. Broken up in relative manifestations it manages to survive as a complete and unbroken unity, at every moment retaining an absolute control over the entire field of its fundamentally discontinuous appearances. This would be entirely impossible, had 'essence' been conceived as a single entity concentrated in one metaphysical point. But if it is conceived as a matrix of its own transformations, the paradox evaporates. Is not a vector completely expressed by its three components? Certainly—within a given frame of reference! The letters $x\ y\ z$ stand, of course, for the whole vector, and not for a part of it.

Furthermore, according to the classical doctrine, essence does not produce its manifestations as a physical force produces work. If it is at all comparable to force, it must be somehow interpreted as a non-mechanical agency (ἀμήχανος δύναμις).[5] This, again, may seem strange and inconsistent. But is the relation by which 'vector' is connected with its own components a mechanical, or causal, relation? The components do not emanate from the vector as energy emanates from the stars! Nor does the vector result from its components as H_2O results from H and O. And yet it is not identical with its components; for the components change relatively to the system of coördinates chosen.

This, however, is a purely negative determination. What does it imply affirmatively? What descriptive properties does the relation possess to comply with its a-mechanical nature? Plotinus offers an answer. The relation between essence and its various manifestations is by him described as ἐπιστροφή, a word which is difficult to translate. Philologically it is derived from ἐπί, a preposition to denote 'being upon' or 'being supported upon a surface'; and στρέφω, a verb denoting 'to turn aside', 'to divert', 'to circle'. The

[5] Plotinus, *Enneades* V, 3, 6.

combination of the two, then, seems to indicate a state of being diverted, or reflected upon a surface, a 'projection'. Thus being, like vectors or tensors, variously 'projected' the essence acquires different appearances, and is therefore an 'abundance' (χόρος) and a 'multitude' (πλῆθος). But it is a rare kind of multitude sustained by a unity, "together one and many". In this paradoxical juxtaposition of one and many I am tempted to perceive the first glimmering of the idea of 'logical groups': essence is a group of transformations, or—in metaphysical terminology—a totality of manifestations. And it is precisely in its quantitative aspect, as totality, that it resists mechanistic interpretation. Numbers and transformations are not machines.

Some very remarkable properties have been historically derived from the definition of essence as 'projection'. It is easily seen that the projected entity does not exhaust itself in any number of projections. It is infinite. Moreover, it is not identical with any number of its projections; it is "nothing of all", and yet it is "all in all" because every particular projection is an expression of the same essence, or of the same "law" that permeates all cases. It is the dynamic principle that sustains all variations (δύναμις τῶν πάντων). Nothing appears in the 'projection' which does not exist or subsist in the essence. It is, therefore, as Nicholas of Cusa expressed it, *omnia in omnibus et nihil de omnibus.* The whole system of pantheism and negative theology can be deduced from this formula. Spinoza is a mere corollary to it.

Essence cannot be added to the whole set of its own manifestations as an extra unit. It is not a thing alongside other things, not an entity among entities. It is for this reason that the metaphysical reduplication of nature into two worlds, real and ideal, is untenable. Nature is one. There is no mystical counterpart of it in some "higher regions' or "behind the curtains". If we wished to symbolize the relation mathematically, we should commit an obvious error, and reveal a complete misunderstanding of the problem, were we to represent essence and appearance in the form of $a + b$. It would be more correct to think of it as $a + ib$. The relation is in the nature of a complex number. This is a source of innumerable paradoxes all of which have been summed up in Hegel's formula for *Reflexion* (= neo-Platonic ἐπιστροφή): *Sie*

ist Setzen, insofern sie die Unmittelbarkeit als ein Rückkehren ist; es ist nämlich nicht ein Anderes vorhanden, weder ein solches, aus dem sie, noch in das sie zurückkehrte; sie ist also nur als Rückkehren oder als das Negative ihrer selbst."[8]

Much has been contributed to the elucidation of the relation between essence and appearance by the Fathers of the Church. Their vocabulary is far removed from our present terminology; but their problem is the same. Much of what they teach about the Trinity belongs to the theory of relations, and much of what they say about God belongs to the theory of ideas. In a large majority of texts one can safely substitute the words 'idea and concept' for the words 'Father and Son', and obtain a meaningful proposition about, and often a new insight into, the nature of the relation between ideas and concepts, or between essence and appearance. As the idea of ideas, as the highest idea, the Father reveals Himself in the "concept" (λόγος); but even in His revelation He is both Word and Ineffable Unity, or "silence" σιγή; absolute "clearness" of logical expression in His "concept", and absolute "hiddenness" of mystical ineffability in His "essence" or 'idea'. The Gnostics presented the relation in mythological form. They personified manifestation or *logos* as Sophia, and the ineffable essence as Bathos. The source of Sophia's tormented heart is her love for the "silent Bathos". She wants to embrace Bathos, but Silence resists the union; for, as Valentine explains, Batho-Sige is ineffable, and the language of the spirit is mute; what can be revealed is based upon what is ineffable, what can be conceived has its roots in the inconceivable. In other words, the logical concept (λόγος) has meaning only in its relation to the meta-logical idea (βαθός). According to Ireneus, "the Son is the measure of the Father, as He conceives the Father". As the physical quantity is a measure of the world-condition, as every concept is, in a far wider sense, a measure, *i.e.*, manifestation of the idea, thus the Son is called the measure of the Father. That is, a manifestation of what can never be fully manifested, a definition of what never be rigorously defined: "the Father is the invisible of the Son; Son is the visible of the Father". This relation is the fundamental secret of Being —a mystery, a miracle, something that happens no one knows how.

[8] Hegel, *Wissenschaft der Logik* II, 1, 1; C.1.

"If you ask me: in which manner is Son sent by the Father?—I shall reply that no one knows the manner of this mission, of this genesis, or revelation, or definition, or whatever we shall call His ineffable birth." The relation seems "ineffable" because it cannot be conceived according to any worldly, sensuous, or "carnal" scheme. And yet for centuries it remains in the center of philosophical attention. Scores of keen and sincere speakers of truth endeavor to describe it to the best of their speculative abilities.

Tertullian, the first in the long list of names, clearly perceives that essence differs from its own manifestations not in number (they are not *two* things), but only in the mode of existence. It is a paradoxical kind of distinction by which, as Hegel puts it, nothing is distinguished (*ein Unterscheiden, wodurch nichts unterschieden wird*): *Ita et quod de Deo profectus est, Deus est, et Dei Filius, et unus ambo; ita et de deo Deus modulo alterum, non numero, gradu non statu fecit, et a matrice non recessit, sed excessit.*[7] Tertullian's favorite analogy is the sun as the source of energy, and light as the expression or manifestation of its energy. Often the relation is compared to that between the root of a plant and its growing stem, or between the fountain and the flowing stream.[8] The comparison is not so poor as it may seem. Tertullian, it must be noted, does not compare the relation between essence and appearance to that between the 'root' (*radix*) and 'fruit' (*fructus*), but to that between the 'root' and the 'growing stem' (*frutex*), or rather the 'growth' of the plant; nor to that between the 'fountain' and the 'stream', but to that between the 'fountain' and its 'flow'. The distinction may appear to be in the nature of scholastic hair-splitting. But for him, and for many generations of theologians after him, it was a most important one. The 'river' is different from its 'source' or 'fountain' as another thing, as a geometrically and *really* distinct entity. But the 'flow' of the river is, in a sense, identical with its 'source'. Similarly 'essence' is different, but not *really* distinct from its appearance. Both are one, and each is intrinsically identical with its dialectical companion: *ambo unus et utrumque alter.*[9] The relation is so different from that which exists between 'things', and so paradoxical from the

[7] Tertullianus, *Apologeticus adversus gentes* 457 (Migne).
[8] Tertullianus, *Libri adversus Praxeam* I 186-187.
[9] *Libri adversus Praxeam* 188. Cf. 194, 210.

'carnal' point of view, that it naturally seems to exceed rational comprehension. And in the ecstasy of comprehending the truth of the paradox Tertullian coins his famous adage: *credo quia absurdum.*[10]

Let us briefly recapitulate the descriptive properties of 'essence'. (1) Essence is a non-mechanical category. (2) It nevertheless has a quantitative aspect, and has been often described as "abundance", "multitude", and "totality". (3) Its relation to quantity, however, is not of the order of arithmetical relations. Essence is a matrix, not an individual number. *Nihil tamen a matrice alienatur, a qua proprietates suas ducit.* (4) It is a matrix of its own manifestations. (5) It is infinite, in the sense that it is indefinitely transformable (*sicut multae figurae sigilli expressae archetypum sigillum participant, et in unaquaque figura sigilli expressa totum*). (6) Within the matrix of its own modifications it is *omnia in omnibus et nihil de omnibus.* (7) It is manifested as a totality in every one of its manifestations, in every variant, without actually or *really* being a part of it. (8) It is different from its manifestations, without being distinct from them.

All the above characteristics are applicable to 'ideas'. It is therefore fair to regard the concept of 'idea' itself as one of the historical variants of the concept of 'essence'. The advantage of this variant lies not so much in its intrinsic excellence—it is in no way better or truer than other variants—but in its direct association with modern science. Ideas are logical vectors. Historically therefore there is nothing paradoxical in asking Einstein to join the company of the Fathers of the Church. Inviting him to join so strange a company, I am not guided by any sentimental desire "to save religion". I may frankly confess that the interests of the Church are entirely foreign to me. The invitation is extended exclusively in the interests of truth, and—under the existing conditions of hostility between science and philosophy—will, no doubt, be rejected.

The mathematical theory of relativity. The mathematical theory of relativity presents the most striking example of the logical principles expounded in the previous paragraphs. In its general form, the theory of relativity is a special case, an application to

[10] *De Carne Christi*, c. 5.

mathematical symbols, of the general logic of relativity; it is the clearest illustration, in mathematical form, of that type of thinking which is based upon the principles of transformation.

'Distance', like anything else, can never be absolutely defined and uniquely fixed. It is just as flexible as anything else that submits itself to a definition or description in logical terms. It is given to us only as a group of possible (actual or prospective) measurements. And the possibility is not excluded that our measurements may come out differently if referred to different systems of coördinates. As a matter of experience, physical distances appear to be definitely fixed only with respect to an immobile frame of reference. If the frame is in motion relatively to the distance to be estimated our calculations come out differently for different velocities. Absolute distance is just as much a logical illusion as the absolute concept of 'man'. Distance is not a single intuition, but a group of transformations. It is not an entity, but a formula, a 'concept', which is bound to give us different results if we apply it to different conditions.

For the lack of space I am not in a position to pursue the comparison any further.

Relativity and dialectics. The dialectical method in philosophy also becomes much more intelligible, and much less paradoxical, if viewed in the light of the logic of relativity.

There is scarcely anything that provokes the scorn of the modern scientist more profoundly than a mere mention of Hegelian dialectics. There is something in the dialectical procedure that offends common sense and is repugnant to those scientifically and mathematically minded; their sound, realistic minds, accustomed to deal with 'clear and distinct' concepts, are perpetually irritated by what seems to them a meaningless jumble of words. The stumbling block is the dialectical treatment of the law of contradiction.

Denn ein vollkommener Widerspruch
Bleibt gleich geheimnissvoll für Kluge wie für Toren.
Mein Freund, die Kunst ist alt und neu.
Es war die Art zu allen Zeiten,
Durch drei und eins, und eins und drei
Irrtum statt Wahrheit zu verbreiten.
So schwatzt und lehrt man ungestört;
Wer will sich mit den Narrn befassen?

Gewöhnlich glaubt der Mensch, wenn er nur Worte hört,
Es müsse sich dabei doch etwas denken lassen.

Thus speaks Mephisto preparing a rejuvenating drink for Faust. Thus think all realists preparing their clear and distinct concepts for popular consumption. To appreciate and properly to understand Hegel it is essential to realize that dialectical philosophy is primarily concerned with ideas, not concepts. And ideas do contain contradictions. It is impossible to eliminate it from them. But such elimination would also be entirely needless; for contradiction causes them no harm.

The realist does not seem to realize that 'to contain contradiction' is not the same as 'to be contradictory'. If we agree to regard ideas as *groups* of concepts transformable into one another, it will be easily seen that as groups they may very well contain contradictory concepts without being themselves contradictory. 1 cannot be – 1, at the same time and with respect to the same system of coördinates; if added they will result in a zero. But in a group, *i.e.*, within a matrix, they may co-exist without causing any harm to one another. We can very well imagine a point in a plain with the coordinates 1 and –1, which then constitute a matrix (1,–1). We construct this matrix, not with the purpose of adding the two numbers, but with the purpose of locating the point. Similarly, within a group of concepts, such as, 'rational animal', 'featherless biped', 'Son of God', the individual concepts may have contradictory attributes; but the whole group does not therefore become contradictory.

Every particular definition, every 'concept' *as stated* within a given frame of reference, is 'true'; but true *only* with respect to that particular frame. In this "only" lies its own self-annihilation. It is valid only as a member of a group, *i.e.*, as a phase, or 'variant', of an idea. In so far as it is valid, it points beyond its own self; and only in that 'beyond' is it really what it is, not in itself; or, in the fortunate expression of G. Watts Cunningham, "the reference beyond self, . . . is just the indication of the fact that *the true self* of the object lies elsewhere than in its own factual existence".[11] The "true self" of an object is in the nature of a

[11] *Thought and reality in Hegel's system* (1910) 35 (Cornell Studies in Philosophy, No. 8).

tensor which, in its totality, is *inherently beyond* its own components taken with respect to any coördinate system whatsoever. Within this "true self" contradiction is, not only possible, but unavoidable. For suppose we discover that what we call 'man'—let us denote it by the letter *a*—displays in one line of thinking a certain set of characteristic elements; and suppose we find out that within another line of thinking, *i.e.*, in a different context, the same *a* with equal necessity reveals opposite elements. This can very well be, because within our *a*, which is a *group*, there are several $a_{\mu\nu}$. This has been definitely stated by Herbart. He writes: "The contradiction cannot possibly be eliminated within a particular M, as a particular. It is, therefore, necessary to assume that its solution lies in a collection of M's".[12]

The concepts, definitions, all that is 'clear and distinct', are merely a surface. In the mechanism of thinking the 'medium', the great 'beyond', the 'emptiness' which surrounds the concepts, is far more important and significant. For it is from the background of ideas that the concepts, and objects, arise. And ideas are known to us precisely to the extent to which concepts are overstepped. Truth lies, not in what we see and say 'clearly and distinctly', but in what we miss, and fail to say. For truth rests with ideas. And ideas can never be 'clearly and distinctly' formulated by a single definition. Every idea requires a number, a set of definitions, or descriptions, to afford even a glimpse of it. "That which we keep back", says Emerson, "this reveals".

HENRY LANZ

STANFORD UNIVERSITY

[12] *Allgemeine Metaphysik* 8 (*Ges. W.*)

DISCUSSION

THE PARADOX OF CERTAINTY

PROFESSOR DUBS' discussion of "The Paradox of Certainty"[1] has called welcome attention to the probability-character of all merely empirical statements. At the same time, however, he has attempted to save the character of "certainty" for the results of what he calls "rational induction", which he believes is the essential procedure of science and of scientific method. I wish to call in question his success at this point.

It may be granted that the scientist's method is "rational induction", as described by Mr. Dubs, *i.e.*, it proceeds by setting up hypotheses. We may grant, moreover, that, finally, only a finite (or even comparatively small) number of hypotheses may actually be held to be possible or practicable or coherent or—whatever other criterion for ultimate selection may be used. The fact seems to remain that the hypothesis finally settled upon by the consensus of scientific opinion—which consensus is precisely what appears so impressive to Mr. Dubs, especially as over against the relativism or even scepticism to which the logicians, in general, seem to have found themselves driven—is determined by a "decision",[2] that is to say, by supposed or simply accepted "convenience"[3] or perhaps on the basis of the principle of parsimony rather than by anything else. In other words, no arguments adduced by Mr. Dubs appear to me to show that any, however universally accepted, scientific hypothesis offered as solution for any specific scientific problem is ever ultimately the *only* possible one. This would apply as much to the specific examples used by him, such as the earth's rotation about the sun, the evolutionary hypothesis and the electronic theory of matter, as to any other. The final choice leading to the much admired so-called "scientific unanimity" on any specific scientific problem, depends ultimately, not, as Mr. Dubs seems to suppose, upon the actually certain demonstration of one hypothesis as the only logically possible one, but rather upon an actual "decision"[4] reached "by mankind and especially by the scientists of our culture-circle".[5] Those of another

[1] This *Review* XLIV 254-266.

[2] To use the term thus translated by Carl G. Hempel from its German equivalent used by Rudolf Carnap and Otto Neurath. *Cf.* Hempel's article "On the Logical Positivists' Theory of Truth", *Analysis* II 58.

[3] This is the conclusion to which Neurath and Carnap find themselves driven. *Cf.* Neurath's "Radikaler Physikalismus und 'Wirkliche Welt'", *Erkenntnis* IV, and "Protokollsätze", *Erkenntnis* III, and Carnap's *Logische Syntax der Sprache* (Vienna, 1934) and "Philosophy and Logical Syntax", *Analysis* II 42-48.

[4] On whatever "good" grounds, or for whatever "justifiable" reasons.

[5] Quoted from Hempel's article, *Analysis* II 57.

culture-circle may "decide" to adopt another hypothesis by just as general unanimity.[6]

If this be so—and, at present, I can see no way of disproving it—then the much admired results of so-called "scientific certainty", so far from having the certainty claimed for the procedure of "rational induction", have the certainty merely of a convenient acceptance or an agreement temporarily decided upon among scientific experts. This is far from real certainty. It still leaves the possibility of a fundamentally different hypothesis wide open. The so-called scientific "success" turns out to be fundamentally not much nearer to certainty than a fairy-tale.[7]

The "rational induction" described by Mr. Dubs is, indeed, used by science and it is a real service to have our attention called to the hypothetico-deductive method of science as over against its usual claims to a so-called purely "empirical" procedure. But it is equally important to see that even for such "rational induction" of coherent and tested hypotheses no finality can be claimed.

As a matter of fact, entirely aside from the discussions of this point by Carnap, Neurath, Hempel and others, Dubs should have seen, from the outset, that it is quite unreasonable to expect certainty from merely hypothetical procedure, regardless of the test made of the fittingness of the hypothesis afterwards. It is difficult to see how a hypothesis could ever be anything more than hypothetical, even if we were not in fact always confronted with the real possibility of other —workable—hypotheses capable of accounting for the same phenomena. After all, the best we would seem to be able to hope for is a very high degree of probability. Such we need, of course, if we are to avoid the dangers of an irresponsible scepticism; and such, I think, despite Mr. Dubs' claims to the contrary, we can have.

Certainty, I should say, therefore, is not a paradox at all. It is beyond the reach of finite man, whether in science, or in philosophy, or in anything else.[8] Even this—dogmatic-sounding—assertion is, of course, not certain.

Is there, finally, any good reason why we should not, at last, dispense with the "quest for certainty"? Why not deal with human knowledge

[6] And for just as "good" or even "better" reasons.

[7] Both Carnap and Neurath do, in fact, admit that there is no logical difference between a coherent system of scientific statements and a coherent system of fairy-tales. The difference is said by them to be an empirical one. Yet Dubs tries precisely to rule out such empirical criteria from his attempt to get "certainty".

[8] I have elsewhere tried to demonstrate this assertion in some detail. On the impossibility of reaching finality in science, *cf.* my paper "On the Possibilities and Limitations of Natural Science" (in *College of the Pacific Publications in Philosophy* III (1934) 29-47), esp. pp. 44-47. On the impossibility of absolute objectivity in philosophy, *cf.* my "Is 'Standpointless Philosophy' Possible?", this *Review* XLIV 227-253.

and experience in terms of what it is and can do rather than waste any tears about something which, since we never actually possessed it, we cannot possibly have "lost"?

PAUL ARTHUR SCHILPP

LOS ANGELES, CALIFORNIA

A REPLY TO PROFESSOR SCHILPP

PROFESSOR SCHILPP has urged four points in his reply to my paper: (1) I have not shown any scientific hypothesis to have actually ever been ultimately the only acceptable one; (2) those hypotheses finally adopted are determined by a "decision" reached "by mankind and specially by the scientists of our culture-circle"; (3) certainty is beyond the reach of finite man; and (4) the best we can hope for is "a very high degree of probability".

In reply I wish to urge (1) that limitations of space prevented me from attempting to show that any scientific hypothesis has actually been shown to be completely verified. The actual procedure of establishing a rational hypothesis is usually quite complicated. It is however wholly derivable from the fundamental requirement that such a hypothesis must show itself to be the *only* one that can deduce the observed phenomena of immediate experience. Such complete verification requires: (*a*) securing the needed hypotheses: rejecting those hypotheses that are merely empirical, superimpositive, derivative, or not pertinent, then collecting all possible pertinent coördinate hypotheses; (*b*) the deduction of a wide variety of consequences from each pertinent coördinate rational hypothesis; (*c*) the checking of these consequences with immediate experience; and (*d*) the discovery of some checking consequence that occurs in experience and that is deducible from only one pertinent coördinate rational hypothesis or from only one combination of them. Such a "crucial" consequence, together with the wide variety of other checking consequences, necessarily establishes the certainty of the hypothesis in question. Usually several "crucial" consequences are exhibited.

This procedure requires much detailed and technical discussion. Such proofs are usually given in introductory college courses in the special sciences, especially physics and zoology, but often without an understanding of the logical procedures involved. Hence the strict nature of the proof is not always exhibited. That strictness is shown when accepted scientific hypotheses are able to refute and convince their keenest critics. For such proofs I can only refer Professor Schilpp to the scientific textbooks or to chapter IX of my *Rational Induction*.

(2) The first part of my previous paper controverted Professor Schilpp's second contention, which was that the actual adoption of certain hypotheses is merely a "decision" on the part of humanity

or of certain scientific circles. "Humanity" makes no decisions, for it agrees upon nothing, not even that five plus seven makes twelve (some otherwise intelligent Africans cannot count that far). I urged that his hypothesis cannot account for the historic fact that certain outstanding scientific results, such as the Copernican hypothesis and biological evolution, have fought their way to acceptance, not merely by certain groups of scientists, but by *all* intelligent and unprejudiced people who understand the proof, generation after generation. Yet these hypotheses have been opposed by the strongest organized institutions for the moulding of human opinion, such as the Roman Catholic Church. Mere probability cannot do that, for even a high probability, such as 'It is highly probable that it will rain tomorrow', always permits anyone to adopt a contrary hypothesis with entire reasonableness and without logical opposition. Only the hypothesis that complete verification (or certainty) has been attained can account for the historic fact that certain scientific hypotheses have been able to fight their way to acceptance against the most strenuous opposition.

(3) Professor Schilpp himself overthrows his third contention, when he draws the inevitable conclusion to his thesis—that certainty "is beyond the reach of finite man"—in saying that "even this . . . assertion is, of course, not certain". If so, the impossibility of certainty can never be more than a mere *dogma,* impossible of complete proof, and possibly false! Such a dogma has no place in a scientific philosophy. Against this widespread belief my paper was a protest.

(4) His fourth statement, that the best we can reach is "a very high degree of probability", was controverted in my previous paper. I showed in four ways that no finite probability is attainable unless certainty is attainable. For, if nothing is certain, it follows that (*a*) all the premises of every probability-calculation are uncertain, so that any probability is unsure and cannot be definitely said to be "high"; (*b*) every probability-statement can itself be doubted, and that can again be doubted, resulting in an infinite diminution of the probability; (*c*) every definite probability is only probable, so that it must be multiplied by another probability, resulting in an infinite regress that reduces all definite probabilities to zero; and (*d*) probability-statements themselves claim to be true; unless they are true, there is not properly any statement of probability. There is thus no way of attaining any "high degree of probability", except by presupposing some certainties. Then the "quest for certainty" is not vain, but indispensable, for without certainty there can be neither science nor philosophy.

The belief that certainty is impossible, although it has secured a wide following, can never be more than a mere dogma. Scientific unanimity, won against severe and long-continued criticism, assures that science is anything but a "fairy-tale". Probability is totally inadequate to

account for that scientific unanimity. Exceptions do not always disprove hypotheses. Do we not then need to revise radically our conception of scientific procedure?

HOMER H. DUBS

THE LIBRARY OF CONGRESS

A NOTE ON PROBABILITY AND ONTOLOGY

DR. GINZBURG'S recent article, *Probability and the Philosophic Foundations of Scientific Knowledge*,[1] illustrates the current fashion in epistemology. That fashion seeks to provide a rational foundation for knowledge by the paradoxical device of arguing that while knowledge has ontological reference in its practical applications, it has and needs no ontological basis for its principles. Dr. Ginzburg states his thesis early, confining it, of course, in this article to probability. ". . . the method of probability . . . requires no ontology but justifies itself by the intrinsic and immanent guarantees of intellectual method".[2] Able and ingenious as is the exposition which follows, I, for one, remain unconvinced. Because of the ability displayed in what he has written, I wish to present for his consideration aspects of the problem I think he has burked.

The quotation just given with its supporting exposition I find not only insufficient but seriously misleading, the more so because it contains in twisted form an important truth. I can bring this out by restating Dr. Ginzburg's thesis in what I consider to be the true form. 'The method of probability can obtain justification from the intrinsic and immanent guarantees of intellectual method *only* in connection with an appropriate ontology, but it does have a justification of a sort apart both from ontology and intrinsic rationality.' This latter justification is readily located. It lies in the fact of empirical success. But we need to be clear as to what that justification is. It is an understandable attitude for any practitioner to take with regard to any method, that how it comes about that the method works does not engage his present attention. It is enough that it does work, enough to warrant expecting it to continue to work—until it does not. This is a justification apart from ontology and equally apart from any character intrinsic or immanent in the method. The justification would be no greater or less were the method internally contradictory or incoherent. For the justification is of the practice only, not of the principles involved in the method.

To rest in this situation is the privilege of the practitioner, not of the philosopher. And Dr. Ginzburg writes as a philosopher. The fact of success may give focus to the philosopher's attention, but the question that confronts him is precisely the ontological issue which Dr.

[1] This *Review* XLIII 258-78.
[2] *Ibid.* 260.

Ginzburg thinks can be ignored as irrelevant. Whether passage is attempted from the fact of success to a criterion of rationality or from the character of a method to its presumptive success, the bridge used must be some sort of concurrence between intellectual principles and the structure of existence. Otherwise there can be no sense in such phrases as the immanent guarantees of intellectual method or confirmation by experience.

If we say the bridge is non-existent or unnecessary, as seems to be the position of Dr. Ginzburg, C. I. Lewis, and others, what is confirmed when a method works? Not that it does work, for that is the fact which is to confirm something. Does it confirm our expectations of success? But such expectations are surely puerile and irrational unless they have some basis. If there is such a basis, it must be in the character of the method and that character must be something we take to be concurrent with the structure of existence and therefore we expect success. That involves ontology. Again, what can be the meaning of the phrase, immanent guarantees of intellectual method? Not that the method is rational. That is the fact which is to guarantee something, not that which is guaranteed. One might as well say that the fact that an apple is an apple guarantees that it is an apple. Unless the phrase is a tautology and an abuse of language to boot, what is guaranteed must be something beyond the intrinsic character of the method but guaranteed by that character. Any such guarantee must rest upon a generic unity, proved or assumed, of rational thinking and the modes of existence. If thought and existence are really simply 'other', then their conjunction whether in what we call failure or success is philosophically non-significant.

That a *rational* ontology is possible and that a primary task for philosophy is to endeavor to work one out, these are the convictions which alone unite two features of probability into a fascinating philosophical problem. These two features are the success of the methods of probability in practice and the curious character, as near as we can make them out, of its principles. I wish to give one illustration of the latter to enforce the inescapability of ontology. Let us take the simple illustration used by Dr. Ginzburg, that of casting a six-face die. The chances of the various throws are familiar to us all, the standard figures questioned by few if any, and the confirmation by experience fairly good. What of the principles involved in the calculus? Calling the chance of throwing a six an "intellectual prevision", Dr. Ginzburg writes: ". . . the intellectual prevision, though indicating only probability, is not without grip on the reality of the throws, provided we know that the intellectual previsions, though invisible in the individual cases, are really operative in a particular experiential situation. These provisions are considered operative whenever we find that the series of throws, though individually they are *either* sixes or fives or fours,

gives us as a whole the distribution demanded intellectually.[3]" A complete analysis of these statements would find a number of phrases worth notice. How, for example, if probability involves no ontology, are intellectual previsions operative in an existential situation? But the focus of interest is in the requirement that a series of throws considered as a whole is to give the distribution demanded intellectually. That this distribution actually occurs is, according to Dr. Ginzburg, to be found prior to the valid application of the calculus of chances. There are two things to be said about that. The first is that if found, and it can be found only in limited situations, it has no significance apart from some ontological principle. If I do find the required distribution in n throws, how is that significant unless I assume concurrence between the structure of the factors governing the fall of the die and the principles in the method which call for just that distribution? Secondly, the mere statement of such a distribution as required intellectually by the method of probability involves one of the most curious ontological postulates I have ever come across. The postulate, though rarely stated in these terms, as well as I can make it out comes to this: in any situation where there is a range of possibilities, each and every possibility will become actual given a long sequence of cases. This assumption is quite different from the assumption of equipossibility. The latter is only a statement of possibility. But the former is a statement of ontological necessity: reality is such that a random sequence of cases will exhaust or bring to actuality all the possibilities of the class. That this postulate is made can be most directly brought out by considering what happens if it is denied. Suppose that after n throws of the die the six has not been cast. If the value of n is 1, is there failure of distribution? No. If the value of n is 5, again no. But if the value of n is 10^{10}, then I suspect Dr. Ginzburg would say the required distribution is not found and a gambler would suspect the honesty of the die or the casting or both. But why? And at what value of n less than 10^{10} would the change take place? Our original premise is only one of equipossibility. Does the failure of any one face to be cast in any number of throws prove that its being thrown is not equally *possible* with the others? How can it, save on the postulate that what is possible must become actual, given a sufficient number of chances. And then, what number?

There is no need to carry the illustration further. It is enough to point out that when the postulate of eventual actuality is accepted, an ontological principle is involved. If it is not accepted, then the failure of the six or any other face to turn up in n throws proves nothing and the distribution required by Dr. Ginzburg can never be confirmed or disproved in practice. So far as I know, the postulate is always tacitly made whenever mere probability is being considered. Take the

[3] *Ibid.* 274.

familiar assertion about the monkeys typing the works of Shakespeare. Since the number of different words involved is finite, the number of combinations is finite, therefore, it is argued, if monkeys were taught to typewrite and were kept at it, eventually by random typing they would produce that combination which constitutes the verbal sequence found in the works of Shakespeare. But this holds only if we assume that random typing will bring to actuality every possibility. That is at once a methodological and an ontological postulate. But is it good ontology? Good methodology? I doubt the former, do not know about the latter, and commend both to Dr. Ginzburg.

That at present we lack an ontology adequate to the varied aspects of modern knowledge or what we take to be knowledge, will I think be granted. Do we gain anything in that situation by contending that the problems of knowledge are independent of ontology? On the contrary we merely make our epistemologies ridiculous. We should face the ontological issues squarely, humbled but not daunted by past and present failures.

HOWARD D. ROELOFS

THE UNIVERSITY OF CINCINNATI

REVIEWS OF BOOKS

The Platonic Legend. By WARNER FITE. New York, Charles Scribner's Sons, 1934. Pp. x, 332.

This book emphasizes the anti-democratic elements in Plato as much as possible. It argues that the *Republic* proposes education for the guards only, that this fact nullifies Plato's perfunctory promise to elevate worthy members of the mass to the ruling classes, so that the *Republic* is a caste-system, that Plato did not have our conceptions of personality and individuality and therefore could see no value in them, that he saw no value in freedom either, that he preferred order and perfection to life, that he was in his own nature a defeated aristocrat, that his family was aristocratic in politics and not "Whiggish" as Burnet argued, and that gentlemanliness seemed of paramount importance to him. "Plato's perfect city, his ideal of a society constituted in accordance with human nature, is . . a city of children. The grown men are a mere handful. The population of the city is composed, let us say, ninety per cent of greedy children constituting 'the many', and nine per cent of well-bred youths functioning as guards; and these are kept in order by one per cent of enlightened philosophers, the only persons in the city who enjoy an adult status."

The book presents Plato's homosexuality as part of his aristocratic nature, and argues against Taylor that the Eros discussed in the *Symposium* is sexual and in fact homosexual, and that according to Plato homosexual love is the only road to spiritual insight. Plato did not stamp the practice of perversion as unnatural and degrading until the very end of his life. The sexual arrangements in the *Republic* are put forward not from the ascetic but solely from the eugenical point of view. Plato's attitude is wholly that of the stockbreeder, and his complete indifference to family-affections is not the ordinary Greek sentiment. It does not occur to him to apply the idea of love to marriage, and he does not forbid adultery but only open adultery.

The author finds in Plato the belief that every subject, including ethics and politics, is capable of becoming the specialty of some expert, and that no one but the expert has a right to speak. The correct translation of *technê* is not art but science, and Plato wishes to see every sphere of human activity reduced to a science and controlled by the scientist concerned. The nature of science is measurement; in the *Protagoras* morality is the measurement of pleasures and pains; in the *Gorgias* it is the measurement of the soul's health and disease. For Plato "mathematical formulation is the sole and final expression of reality". He gives to the word knowledge (*epistêmê*) a meaning so absolute and limited that only mathematics can pretend to satisfy it. He is not playful but serious about the number that determines the degeneration of the ideal city, and also about the calculation that the

just man lives 729 times more pleasantly than the unjust. In general, the interpreters have attributed altogether too much playfulness to Plato. "It is a canon of orthodox criticism that Plato can never be naïve; any absurdity must then be construed to be either 'playfulness' or 'irony'."

The book clearly implies that a great number of serious misinterpretations of Plato are current today, and that this currency is mainly due to the fact that what Plato really said is extremely unpalatable to the modern mind. That is essentially the author's main position; and, because there are two other aspects of the book that I cannot agree with at all, I want to say clearly that this position seems to me fundamentally sound. There is a great deal of misinterpretation of Plato in our colleges today, most of it making him more of a modern than he was; and the experts do not scotch these misinterpretations as they should, but actually encourage many of them. Plato was so convinced an aristocrat that he did not think it worth while to say clearly that the masses would receive no education; that was too obvious to him, as it would have been to any of his contemporaries. The average modern is so convinced a democrat that, in the absence of an explicit statement to the contrary, he assumes that Plato intended education to be universal. "If", he unconsciously reasons, "if Plato had held the extremely paradoxical and repulsive doctrine that only the few should be educated, he would surely have said so definitely and argued for it at length." But the true reasoning is that if Plato had held the—to most Greeks—extremely paradoxical and ridiculous doctrine that all citizens should be educated, he would have said so definitely, as he does in the *Laws*. (And in the *Laws* universal education of the *citizens* means education of only the smaller part of the *population*.) This sort of mistake is very frequent in contemporary interpretation of Plato's political views. On many questions he is more or less silent because he thinks the aristocratic answer patently correct; and the moderns, who think the democratic answer patently correct, interpret his silence in favor of democracy. One might have supposed that the error arose from reading Plato without much knowledge of his milieu, were it not for the fact that some of the experts reason in the same way. There is a strong tinge of the *apologist* in some of our experts. Their desire that we shall know the true history of thought is sometimes less vital than their desire that we shall love Plato. Dr. Fite had given us a useful warning. It is a pity that he did not add to his iconoclasms an attack on Constantin Ritter's view that slavery is abolished in the *Republic*.

But from two other aspects of Dr. Fite's book I must emphatically dissociate myself. He examines Plato not merely as a thinker but also as an artist, and he finds that his art was not so much great as polite and graceful. "Dickinson's imitation of Plato's *Symposium* is a finer example of taste and skill than the original *Symposium* of Plato", and

"any of the greater modern novelists is a greater master" of dialogue than Plato. "If Plato is to be regarded as a creative genius it seems to me that he belongs in the order of Aristotle and Newton and Darwin; and hardly in the order of Shakespeare, Cervantes, Beethoven, and Brahms". This estimate of Plato as a poet seems to me immensely wide of the mark.

To come to the second point, the book is written in a tone of contempt. Dr. Fite is strongly opposed to most of the Platonic doctrines that he interprets; he is not at all grateful to Plato for having suggested them; and he does not argue the case against Plato, but dismisses him with a sneer. The most striking feature of the *Gorgias* "is an exhibition of selfrighteousness and pride of wisdom bordering on insanity". "The mathematics of the line is so much nonsense." The tribute to Socrates' endurance at the end of the *Symposium* sounds "more like the tribute of a sporting adolescent to a favorite football hero or prizefighter". "Plato the man was not quite a man." "It would be hard to find a more striking exhibition of 'feminine' vanity and selfconceit" than the seventh letter. In these violent utterances Dr. Fite has departed from the disinterested study of the history of thought a good deal further than the apologists whom he attacks.

I congratulate Messrs. Charles Scribner's Sons on the unusual beauty of the wrapper, but I regret the phrase "by a recognized authority". If this has any place here it should mean "by a recognized authority on Plato", which Professor Fite is not and does not aspire to be.

RICHARD ROBINSON

CORNELL UNIVERSITY

Ethics and Moral Tolerance. By ARTHUR KENYON ROGERS. New York, The Macmillan Co., 1934. Pp. viii, 323.

Ethics and Moral Tolerance is, like its author's earlier *Theory of Ethics*, an important contribution to the literature on ethics, even if the views of the two books are too nearly identical to make the theories of the latter volume seem particularly novel. Professor Rogers' conception of goodness is in any case so noteworthy that a fresh exposition of it cannot fail to be stimulating, even, and not least, to readers who, like myself, at the end find themselves quite unable to accept the view so skillfully defended by its author. Nor is the reader's enriched understanding of the moral problem, as it emerges from the reading of a work like the one here to be reviewed, due solely to the discussion of what might perhaps be referred to as the basic and ultimate problems of ethics, or of general axiology. As a judicious and thought-provoking commentator on human life and modern social trends, Professor Rogers may perhaps rank even higher than as a contributor to ethics in a more formal sense.

Whether or not there can be such a thing as a disinterested search

for truth may be debatable; certain it is that most philosophers have had something like an axe to grind, though few may have been honest or brave enough to admit it, and for this reason it is always well to inquire into the motives underlying a particular treatise, before one undertakes to pass judgment upon it. The presuppositions of a given work may not necessarily justify the desired conclusion; yet they are virtually certain of enhancing its intelligibility—especially, perhaps, to persons of a different turn of mind. And in the present case such an investigation into the author's basic presuppositions seems especially necessary, since otherwise the reader may fail to perceive the significance of the reference to "moral tolerance" in the title of Professor Roger's book. I take it, therefore, that the present work can be most satisfactorily understood if one remembers that the author on the one hand is profoundly opposed to—if not even afraid of—belief in authoritative moral standards, because of his belief that this necessarily encourages a habit of moral intolerance on the part of their believers —no greater sin apparently being conceivable—while he on the other hand recognizes that "a logically consistent naturalism in ethics is committed to a universal tolerance" such as he finds neither possible nor, as a matter of fact, quite desirable. Needless to say, the search for standards that will be really binding, and yet not, in a certain sense, universally so, is one holding out such slight prospects of success from its very beginning that none of the inconsistencies and difficulties into which our author finds himself driven can strike the thoughtful reader as particularly surprising.

The main problem concerns, as indicated, the nature of goodness. Professor Rogers assumes, to begin with, that goodness may be either 'natural' or 'moral'. In the former sense, which is the more ultimate, we are told that "good is a 'reflective' notion—a quality which is *judged* to belong to an object and not merely the presence to experience of a passive quality or feeling" (165). "Goodness is not a description of felt experience but a new character added by an act of judgment to the original experience; if we must use philosophical language, it is synthetic and not analytic" (165 f.). This 'naturalistic' good is nothing but the character of being approved by someone or somebody, anything being good in this sense if and in so far as anybody approves it and the approval meaning no more than liking, or the reflective enjoyment of something already found to be pleasant. Moral good, on the other hand, is a good "which maintains its right to be called good when it comes into conflict with competitors, and which claims in consequence a higher ranking" (191). This "*moral* good" takes on its specific character through the mediation of conscience. Anything becomes morally good when and only when its omission would result in moral disapproval. Rightness, on the other hand, is not strictly an ethical but only a relational term. "Anything is right when

it is appropriate to a given end or standard, and standards may be of many kinds" (216). Both duty and goodness, in the wider sense, thus have their source in sentiment—the former in disapproval, mainly in the form of self-condemnation; the latter in approval.

The fact that value thus springs from feelings or from sentiments rather than from reason does not, however, imply that it is subjective in character. Objectivity, says our author, is rather presupposed. "But the thing to which objective truth attaches is the whole natural situation into which an object of approval enters, and where it gets its claim to valid goodness not as though it were independent of man and his feelings, but through its contributions to a worthwhile human life that concretely would not be recognized as worth while in the absence of feeling and emotion" (176). Even absoluteness belongs to the good, in a qualified sense; all goods being absolute "in the sense that the logical character of goodness has no reference to time or local circumstances" (216). No good is absolute, however, "in the sense that it is good for everybody, or a good for me always and without restriction". The last statement, like the author's rejection of an objective ranking of the values according to intrinsic excellences, is apparently due, in part at least, to his failure to recognize that we never in real life are confronted with the simple alternative of choosing between two or more isolated values. Once it is recognized that our actual choices must deal with complex value-situations, and that our duties thus must be determined by values-in-relation rather than by values-in-isolation, all the difficulties previously facing the believer in an objective rank of values seem to disappear.

Lack of space unfortunately forbids not merely such a full and critical exposition of Professor Rogers' theories as they really merit; even the most cursory reference to most of them is thereby made quite impossible. I feel, however, that at least a passing reference must be made to his singularly effective criticism of Fite's ethical theory in the second chapter, and to the attempt, in the twentieth chapter, to derive the claims of the ideal on human life from the sentiment of self-respect.

SVEN NILSON

MINNEAPOLIS, MINNESOTA

Descartes. By S. V. KEELING. London, Ernest Benn, Ltd., 1934. Pp. xii, 282.

In accordance with the plan of the series of monographs to which Mr. Keeling's work belongs, his book is divided into three parts. Part I gives an admirable sketch of Descartes' life along with an account of "the intellectual climate" of his time; Part II presents (in 116 pages) the Cartesian epistemology, metaphysics, and cosmology, while some of the dominant characteristics of the Cartesian school are pre-

sented in Part III, which concludes with two chapters in which some of the merits and defects of Cartesianism are appraised.

Descartes's metaphysics, Mr. Keeling finds, "develop from an analysis of the *cogito* situation, which yields three central conceptions: those of mentality, materiality, and divinity, . . . ". Mr. Keeling's statement of his case for the *cogito* involves his admirable analysis of the conception of "simple natures", fundamental alike to Descartes' epistemology and to its rejection as atomistic. Briefly stated, Mr. Keeling's main point here is that we must notice the difference between simple and complex natures as they exist in fact, and as they are in and for knowledge. In fact simple natures "are not isolated, but necessarily conjoined". Deduced knowledge will sometimes be absolute; but when the problem at hand is highly complex, its analysis into intrinsically ordered ultimates and their concurrent synthesis as so ordered may not be feasible. In all such cases, deduction may validly conclude with 'relative' ultimates that are, or can be, explained in terms of simple natures. Thus, on this interpretation, there could be no question as to how simple natures come together in fact, for they never exist apart. Likewise, simple natures as known are intuited not in isolation, but in a necessary order disclosed by the analytic and synthetic *cheminement* of the understanding.

The mind, in being assured of its own existence, also discovers certain "common notions" or simple natures (*Principles* I 13), which Mr. Keeling assigns to two classes; *viz.* (1) "Things or affections of things", and (2) "eternal truths" or maxims". Simple natures of the latter sort are the principles of knowledge. Of these, Descartes indicates three of particular importance for his metaphysics: (1) the necessary relation of attribute to substance; (2) the necessity of a cause or sufficient reason for whatever exists; (3) the principle of noncontradiction. It is in virtue of the first of these that the claim of the *cogito* to demonstrate the existence of spiritual substance is valid. For Mr. Keeling does not reject the contention of the *Principles* I 11, that a mode cannot be a mode of nothing. Yet this contention would seem to be merely verbal. If an event is properly called a mode, it must then be the mode of a substance. But the information that for Descartes "mode" and "substance" are correlative terms is not the knowledge that any fact whatever *is* a mode.

Since it is only in virtue of his conclusion, "God exists", that Descartes can avoid a solipsism of the present intuition, Mr. Keeling considers that conclusion to be no less fundamental to Descartes' philosophy than the *cogito*. "The Cartesian circle", and the charge that, consistently with the assumed possibility of the *malin génie*, Descartes could not have attempted a demonstration of any sort, both "rest on a careless misinterpretation of Descartes' text". It is no doubt careless,

as Mr. Keeling urges in detail, to make Descartes say that God guarantees the truth of clear and distinct ideas; for, being intuited, such ideas are not open to question. Yet Mr. Keeling finds that the memory on which all deduction depends does require the divine guarantee. Since Descartes's demonstrations of God's existence are inferential, their validity requires the divine veracity, and "the Cartesian circle" therefore remains. In a text of rather studied consideration, Malebranche urges that our knowledge of God must be direct, because it is only in virtue of such knowledge that the hypothesis of the *malin génie* may be eliminated. For so long as that hypothesis is entertained, an attempt to demonstrate anything by inference in a world wherein *ex hypothesi* 2 x 2 may be equal to 16 could be only absurd. Therefore, God's existence must first be known by *simple vue* or intuition, in order that the validity of the operations of the understanding may be established as a consequence of that "vision of God". As a criticism of Descartes' attempt to demonstrate God's existence after having assumed that all inference may be invalid, Malebranche's point here would seem to be hardly careless, but rather to carry with it the moral that any attempt to reach by inference a criterion of all inference can only beg the question.

Mr. Keeling's treatment of the Cartesian School is enviably dexterous and clear in its exposition of the problems of 'knowledge about' and of causation, as they were dealt with by Régis, LaForge, Cordemoy, Geulincx, Arnauld, and Malebranche. The volume of *Cartesian Studies* which Mr. Keeling's preface announces for the future will contain, it is to be hoped, more about these thinkers, as well as the promised elaboration of points in his present skillful and enlightening interpretation of the Cartesian philosophy.

RALPH W. CHURCH

CORNELL UNIVERSITY

Nouveau traité de psychologie. Tome troisième. Les associations sensitivo-motrices. Par GEORGES DUMAS. Paris, Félix Alcan, 1933. Pp. 462.

This excellent work continues, as we noted (this *Review*, XLIII 4) in reference to an earlier volume, to reproduce on a more extended plan the *Traité* published in 1923. The third volume of this edition corresponds to the third book of the first volume as originally published and covers the same ground. The first book is concerned with "L'équilibre et l'orientation", which is the same as the title in the earlier edition (except that the words are in the opposite order); the second book is on the expression of the emotions (pp. 41-295); the third book on "les mimiques"; the fourth and last book on "le langage". The treatment in each case is adequate; the historical aspect of the theory of emotions receives considerable attention so far as concerns

the work of Descartes and his successors to the present time, and historical references appear in other sections. The emphasis naturally falls on physiological conditions and psychological analysis. The nature of of the major topic (emotions) lends itself to illustration, and this volume is enriched by the presence of one hundred and fifty-five figures which include, in addition to physiological diagrams, the typical photographs of emotional expression, some reproductions of pictures and full-page portraits of A. Comte and Victor Brochard. For anyone who has any interest in this very diversified part of psychology this volume will provide entertainment and sound instruction equally.

G. S. BRETT

UNIVERSITY OF TORONTO

Arturo Schopenhauer. L'ambiente, la vita, le opere. Per UMBERTO A. PADOVANI. Milano, Società Editrice "Vita e Pensiero", 1934. Pp. x, 214.

La metafisica del bello e dei costumi di Arturo Schopenhauer. Per AURELIO COVOTTI. Napoli, Casa Editrice Rondinella Alfredo, 1934. Pp. xvi, 206.

Professor Padovani's volume is presented as the first part of a more extended treatise on pessimism and the problem of evil. The second part is meant to include a criticism of Schopenhauer's pessimistic thought, and in the third the author is to proceed from Schopenhauer's irrationalism and pessimism to a critical discussion of the main proposed solutions of the problem of evil in the history of thought, and so to a concluding statement of the theistic Christian solution. In this larger setting the present work is to find its place. In its first chapter the author deals with the historical-systematic position of Schopenhauer's philosophy, its sources and kinships; in the second a biographical sketch of Schopenhauer is followed by an analysis of his character; the concluding chapter examines Schopenhauer's works and surveys the range of his influence, considering among his disciples Wagner, Nietzsche, Hartmann, and Deussen. Despite Schopenhauer's negation of orthodox Christian theology, the author points out certain kinships of his tragic view of life with Christian ideas, and this Christian-Catholic revision of the more usual evaluation of Schopenhauer's philosophy is stimulating; it should make the more careful reader look with real interest to the publication of the next two volumes of Professor Padovani's work.

Professor Covotti's volume summarizes, in faithful paraphrase and extended quotation, the substance of the aesthetics and the ethical-social philosophy of Schopenhauer. This summary should serve to interest the Italian beginner in a further and more critical study of Schopenhauer's thought.

RADOSLAV A. TSANOFF

THE RICE INSTITUTE

A Common Faith. By JOHN DEWEY. New Haven, Yale University Press, 1934. Pp. 88.

This little book is stirring up an immense amount of excitement and it will continue to do so for a long time. Naturally enough, for it is Mr. Dewey's first comprehensive statement of his religious views. The world-situation being what it is and he being what he is, some such result was to be expected. But there is a second reason. Mr. Dewey has gone to the heart of the matter. He has deliberately made central the problem whether we have any reason to look for help from God as a being and, if we have not, whether it is all up with a religious quality in human affairs. This question is faced squarely and of course with conspicuous ability. Among Mr. Dewey's writings during the last half century there is none more incisive, more intellectually and emotionally mature, more alive with an intense, if unsentimental, interest in man's destiny.

Perhaps the most arresting thing is the distinction insisted upon between religion, any religion past or present, and the religious attitude or function. This is so sharply drawn that it almost seems as if Mr. Dewey were saying that every activity in the world may take on a religious character, excepting religion. The point is that in his view religion "always signifies a special body of beliefs and practices having some kind of institutional organization, loose or tight", while the religious attitude "does not denote anything that can exist by itself or that can be organized into a particular and distinctive form of existence", but quite the contrary "denotes attitudes that may be taken toward every object and every proposed end or ideal". Beliefs and practices connected with religion are declared to be encumbrances, and it is argued that when what is genuinely religious is emancipated from them "then, for the first time, the religious aspect of experience will be free to develop freely on its own account".

Religions imply dependence upon some unseen higher power, and when of elevated quality aim "to introduce perspective into the piece-meal and shifting episodes of existence". But redefinition has often been made necessary by intellectual and moral requirements. This, says Mr. Dewey, "compels us to ask what conception of unseen powers and our relations to them would be consonant with the best achievements and aspirations of the present". For his answer we may select these words: "The idea of invisible powers would take on the meaning of all the conditions of nature and human association that support and deepen the sense of values which carry one through periods of darkness and despair to such an extent that they lose their usual depressive character".

The space assigned to this review rules out any consideration of Mr. Dewey's puzzling adherence to the word God, his treatment of atheists and humanists, his endorsement of churches deprived of religion, his

silence regarding the schools as religious agencies. After all, a critique of these items would not change the positive message of the book. To be religious would still mean to assume responsibility for conserving, transmitting, rectifying, and expanding the heritage of values which is ours "by grace of the doings and sufferings of the continuous community in which we are a link". In Mr. Dewey's concluding words: "Here are all the elements for a religious faith that shall not be confined to sect, class, or race. Such a faith has always been implicitly the common faith of mankind. It remains to make it explicit and militant."

M. C. Otto

University of Wisconsin

The Philosophy of John Dewey. A Critical Analysis. By W. T. Feldman. Baltimore, The Johns Hopkins Press, 1934. Pp. x, 128.

This volume, the outgrowth of a Ph.D. dissertation presented at Johns Hopkins University, is not a definitive study of the philosophy of John Dewey—nor does it claim to be. It is presented as a "necessary prolegomenon" to any such study, and largely justifies itself as such. Its primary aim is to further "the cause of specificity in philosophical discussion" by showing how "Dewey has combined into one philosophy a diverse set of principles which are not completely congruous with one another and are even in some cases contradictory".

Chief among the pairs of contradictory concepts which Mr. Feldman finds underlying Prof. Dewey's philosophy are the following. (A) Creative novelty, with its notion of intelligence as an emergent; and the doctrine of continuity, with its more behavioristic account of intelligence. (B) The doctrine of the essentiality of relations, inherited from Dewey's early idealism; and the principle of indeterminacy. This conflict exhibits itself metaphysically in Dewey's tendency toward both "totalism" and pluralism. (C) The postulate of immediate empiricism and the more biological notion of experience which Dewey also holds. A commendable feature of Mr. Feldman's treatment of these (and other) conflicting elements is his care in separating mere chronological changes in philosophical standpoint from the conflicting principles which Dewey demonstrates in his fully established position. Unassimilated remains of Dewey's early idealism are doubtless the source of those conflicts which the present volume emphasizes.

The book is written from the point of view of epistemological dualism and consequently follows the broad outlines of criticism already laid down by A. K. Rogers, A. O. Lovejoy, and others. But, in addition to rendering a service in systematizing these familiar arguments, it also provides a good deal of original critical material. Its chief short-coming lies in its preoccupation with epistemological issues, to the exclusion of those social, ethical, and aesthetic aspects of Dewey's

work which constitute a major part of his philosophy. Dewey's own pervasive interest in logical theory renders this less unpardonable than it otherwise would be, but does not justify the exclusive emphasis offered in this otherwise able criticism.

E. T. ADAMS

COLGATE UNIVERSITY

Le nouvel esprit scientifique. Par GASTON BACHELARD. Paris, Félix Alcan, 1934. Pp. 182.

In a delightfully untechnical style which few scientific minds in this country possess, M. Bachelard has examined critically the philosophic concepts and problems of recent physics. "The new scientific spirit" was ushered in by the non-Euclidean geometries and non-Newtonian mechanics, which robbed the classical mechanics of its realistically conceived absolute space, time, mass, and force. It furthermore attacks the logical framework of the older mechanistic philosophy of science when it substitutes for the certainties attached to the classical axioms and laws of natural science the probabilities of statistical inferences.

The Cartesian epistemology which assumed the self-evidence of axioms, the absolute and real nature of "simple" ideas, and the absolute invariance of laws, must give way to the postulational method, to operational definitions, and to the relative growth of knowledge through progressive approximations. This non-Cartesian epistemology is opposed to the conceptual realism which the late Émile Meyerson defended so long, for there is, according to M. Bachelard, no static dualism between a posited realm of rationality and a given fixed residue of irrationality in the recent investigations of the internal structure of the atom. The radio-active, undulatory, and corpuscular characters of matter have revealed a complexity that is opaque to the Cartesian analysis that would construct nature out of simple configurations. M. Bachelard denies Cartesian simplicity to the initial postulates of mathematical physics because it is always the complex with which we start, and only the relatively simple with which we end our inquiries. The mathematization of physical data is not "simple" nowadays, although identification of physical properties by numerical coefficients simplifies research.

These remarks of M. Bachelard about simplicity would have been aided by a distinction between psychological and logical simplicity. Psychological simplicity is a matter of familiarity and ease of comprehension, whereas logical simplicity is a matter of a minimum of postulates. Science seeks logical simplicity at the expense of psychological simplicity. I think it is unfortunate that M. Bachelard cannot escape from the psychological approach which inadequately renders the logical difficulties of modern physics as conflicts of imagery.

Yet in this small volume M. Bachelard has surveyed nearly all the principal contributions of recent physicists—incidentally, the number of American scientists referred to is unusually large—which is in itself a remarkable literary feat. The very fact that he has avoided all mathematical expositions may explain why he also avoids most of the logical problems involved and has dealt mainly with the psychological ones. In any case he has brought to bear the traditional philosophical issues upon the rapidly changing concepts of recent physics with greater success than attends the more sterile efforts of scientists untutored in philosophy and of philosophers untrained in the sciences. And it does not appear from his analyses throughout the book and the Bergsonian outcome in terms of which recent science appears as a manifestation of the creative consciousness of the *élan vital*, that M. Bachelard has slavishly followed the doctrines of Bergson throughout. Rather he has come to Bergsonism as a result of his own conscientious and independent efforts.

PHILIP PAUL WIENER

COLLEGE OF THE CITY OF NEW YORK

The Chances of Surviving Death. The Ingersoll Lecture, 1932. By WILLIAM PEPPERELL MONTAGUE. Cambridge, Harvard University Press, 1934. Pp. 98.

In the 1932 Ingersoll Lecture on the immortality of man, Mr. Montague has exploited a private passion in the interests of a public one. Ever since he crossed a bridge in California thirty-five years ago, Mr. Montague has been zealously convinced of the potencies of the principle of "potential energy" as a metaphysical, epistemological, and psychological instrument. In his Ingersoll Lecture he again invokes the principle, this time in the interests of a satisfactory form of immortal life.

Briefly, the character of the concept and the nature of its present utilization are as follows. At the stage of physiological process when afferent (sensory) nerve-impulses are transferred, in the central nervous system, to efferent (motor) channels, there is a loss of kinetic energy and, presumably, its transformation into potential energy. This potential energy may be identified (64 f.) with sensation or consciousness or soul. Further, because the soul ("potential energy") is a substantive existing in its own right, it may persist after the body is disintegrated. And because it is the agent of organicity and self-transcendence (comprehending purposiveness and memory), it is, even as "potential energy", the repository of all that is most noble and most typical of human character, and its persistence is a positive value including, as it does, the possibility of ultimate rapport with that "greater Life in which it has its little being" (98).

Mr. Montague's frank, straightforward, withal modest conduct of

his inquiry is most praiseworthy. There are, however, a number of critical issues which I should like to raise.

1. The existence of potential energy in the nervous system, at least as far as the neurologist has been able to determine, is a doubtful matter. Kinetic energy in the form of light waves, for example, is transformed into kinetic energy of a chemical or other form at the retina, but there is no evidence for the view that the kinetic neural energy which passes along the neuron as the neural impulse is transformed at the synapse into potential energy. In fact, what happens at the synapse is still too much in doubt among psychologists and physiologists for philosophers to talk glibly about it. (See K. S. Lashley, *Psychological Review*, XXXI 369; C. J. Herrick, *Introduction to Neurology*.)

2. Is potential energy so much more capable of "self-transcendence" than kinetic energy?

3. Potential energy need not be more resistant to disintegration than kinetic. The final thermo-dynamical equilibrium which the principle of entropy predicts applies to potential as well as to kinetic energy.

4. Is not the principle of parsimony violated in the inference obtainable from the analogy of the violinist and his music (27) that not only is there a body and a mind, but a body and a mind and a Soul?

HARRY RUJA

CHICAGO, ILLINOIS

Da Guglielmo d'Auvergne a San Tomaso d'Aquino. Volume secundo. L'origine delle cose de Dio in Guglielmo d'Auvergne. Per AMATO MASNOVO. Pubblicazioni della Università del Sacro Cuore, Serie prima: Scienze filosofiche, Vol. XXII. Milano, Società Editrice "Vita e Pensiero". 1934. Pp. viii, 204.

Professor Masnovo has planned to write an extensive study of the development of philosophical thought from William of Auvergne to St. Thomas Aquinas. The first volume of this work, which appeared in 1930, dealt with the approach to God as taught by William of Auvergne. This second volume deals with the origin of things from God. A third volume is promised in which the author plans to study the nature of things produced by God, with special reference to the problem of the nature of man. These three volumes on the philosophy of William of Auvergne will furnish the basis for a comparative study of the thought of St. Thomas in respect of the problems discussed by William.

The method followed by the author of this work is at once analytical and historical. The writings of William of Auvergne, Bishop of Paris and Chancellor of the University during the second quarter of the thirteenth century, are closely examined for the purpose of reaching a systematic exposition of his teaching, and, at the same time, his thought

is expounded with constant reference to the intellectual environment in which his philosophical outlook developed.

In this second volume Professor Masnovo introduces his topic by a statement of the problem of the origin of the world as it presented itself to William of Auvergne. Then follows a tentative effort to provide an historical orientation to the preliminary problems of "matter" and the "eternity of the world". Avicenna and the twelfth-century votaries of the Avicennian conception of the universe are discussed at considerable length. The problems, both old and new, to which the Arabian influence on the philosophy of the West during the Middle Ages gave rise are dealt with before the author proceeds to show that William of Auvergne set himself decidedly against the Avicennian trend and definitely opposed the doctrine of the "eternity of the world". A final chapter, aptly entitled "La scure alla radice", shows William at grips with the Neo-Platonic doctrine of emanation and prepares the way for the discussion (to be developed in a subsequent volume) of his solution of the problem of intelligence and the relation of knowledge to existence.

Masnovo's second volume marks an important step forward in the development of his study of the thought of William of Auvergne. It is characterized by the same scholarly care and solicitude for accuracy which marked his previous volume and if, at times, it lacks something in critical acumen—as, for example, in the author's discussion of the Avicennian influence on William's thought—the reason is perhaps to be found in that almost inevitable tendency of the writer of such a treatise to make a hero of his subject and to be lenient with regard to his lapses. A historian of philosophy ought to be on his guard against playing Homer to his hero's Achilles—to use a figure suggested by Masnovo himself when he complains that William of Auvergne is not sufficiently appreciated *caruit quia Iliade*.

GERALD B. PHELAN

THE INSTITUTE OF MEDIAEVAL STUDIES
ST. MICHAEL'S COLLEGE
UNIVERSITY OF TORONTO

DESCRIPTIVE NOTICES

Philosophers Speak For Themselves. Guides and Readings for Greek, Roman, and Early Christian Philosophy. By T. V. SMITH. Chicago, The University of Chicago Press, 1934. Pp. xxiv, 800.

Professor T. V. Smith and the University of Chicago Press have rendered an important service to all teachers and students of ancient philosophy by bringing out this extensive collection of carefully chosen selections from the writings of the great classic philsophers. The author's "Friendly Preface for Aspiring Minds" serves as a general introduction, but there is a brief exposition at the beginning of each chapter which will aid beginners in comprehending the selections, and there are short biographical sketches of each philosopher. Due to the fact that Dr. Nahm has recently brought out his *Selections from Early Greek Philosophers,* Professor Smith wisely limits his material on the pre-Socratics to six short chapters. This enables him to devote more space to the Roman and Early Christian thinkers. There are four valuable appendices, two of which contain selections from medieval philosophers.

D. S. ROBINSON

INDIANA UNIVERSITY

Political Power. Its Composition and Incidence. By CHARLES EDWARD MERRIAM. New York, Whittlesey House, 1934. Pp. viii, 332.

This book is an attempt to bring Machiavelli's *Prince* down to date. The great Florentine had the purpose of discovering the means by which a ruler may gain and hold power. His treatment was thoroughly objective; ethics were entirely divorced from his discussion. Professor Merriam uses the most recent apparatus of the scientific, particularly the psychological, method. His subject includes not merely power exercised by monarchical rulers, but wherever found, whether in the state, church, or other social organization. But he also completely excludes all ethical assumptions from his treatment. His approach is thoroughly objective, descriptive, indeed, behavioristic. While not a great book, it is a very useful excursion into territory almost unexplored since Machiavelli's *Prince* was written in 1513.

W. J. SHEPARD

OHIO STATE UNIVERSITY

Geist und Sache. Grundlegung der Theorie der Geisteswissenschaften und Klärung des Sinnes kulturellen Schaffens. Von WILHELM GREBE. Frankfurt am Main, Moritz Deisterweg, 1934. Pp. viii, 226.

The author first proceeds to show that the term "spirit" can be defined only as conscious and significant action with reference to things. The world of spirit is not something "behind" the individual, experienced acts, nor something separable from such conscious acts. It follows that there is no such thing as "objective spirit", a realm having laws of its own to which man is subject. What necessity there is in human action is a necessity resulting from the factual state of affairs towards which action is directed. With some degree of skill and considerable verbosity, the author develops the

implications of this thesis, showing that any significant science must deal with things, and that the sole *Geisteswissenschaft* is history, in the sense of a chronology of the doings of man in various fields such as physics or politics.

For this discipline the author has scant respect. Since its subject-matter is treated entirely from the "outside", "spirit", in the sense previously defined, fails to appear either in the writing or the reading of history. An over-developed historical interest, with its search for tendencies, laws, and criteria of what culture ought to be, leads to artificiality, pedantry, and preciousness; philosophy, for example, becomes a form of antiquarianism. True cultural creation and development results not from the reverence for "time-spirits" or for the "beauty" of an age, but from individual, significant action in the world of fact. Only one exception to his rejection of all cultural ideals is permitted by the author. Germany possesses a peculiarity which provides the animating force for significant action; thus arise German physics and mathematics. These remarks suddenly arouse the reader from his torpidity after reading the discussion of the previous pages, as he observes with suspicion the direction of thought. This alarm is increased in the last few pages where the notion of significant action is given pedagogical application. Sports and gymnastics and other practical disciplines take the place of the humanities; for the latter lead the student to live in a shadowy world of ideas, while the former teach him to act. In spite of the earnest recommendation to significant action, the significance of action still remains somewhat obscure at the end of the treatise, until one is reminded of a remark in the preface. The book intends to contribute to a "renaissance of our German spiritual life . . . as it is known in Adolf Hitler's spirit".

J. R. Cresswell

West Virginia University

Platon et l'art de son temps. Par Pierre-Maxime Schuhl. Paris, Félix Alcan. 1934. Pp. vi, 126.

The text of the author's thesis, if printed without footnotes, appendices, bibliography, etc., would occupy about thirty-four pages of his volume. That is to say, it is about as long as a double contribution to this *Review*, and takes about as long to read. The author deals with Plato, not as a philosopher or creative artist, but in a secondary way. What Plato says about the 'empiricism' or the 'wizardry' of artists is explained by showing clearly, and with irreproachable erudition, just how the plastic artists of Plato's time produced their effects. By focusing passages which indicate a common tendency at work in all the plastic arts of the time, the author throws new light on many a Platonic passage which most of us have been content to understand from its context. The result is to make Plato's work appear far more factual and concrete, and far less a matter of genial theory, than most of us had supposed. The work is very carefully written, without demonstrable errors of any sort whatever—a rare achievement. For what he has done, Plato-students will be grateful.

Rupert Lodge

University of Manitoba

A Sequential Science of Government. A Study in Systematic Political Science. By DENNIS DEWITT BRANE. Western Reserve University Press, 1934. Pp. viii, 90.

We need more books like this. Like Harold Laski's *Politics* it attempts to put in brief compass not only a theory of the state and of politics but a method for systematically studying these bewildering concepts. Such essays are sorely needed to bring light and order into that wilderness of fact, fancy, and fiction which passes for Political Science in too many of our institutions of higher learning.

The state, says Professor Brane, is "an institution of Power for social control". Form and function are intimately related and "the physiology of the state cannot be comprehended without insight into the nature of the work it is trying to do". Government is a mechanism, creature and creator of law, for "the management of human affairs in order to restrain the interests of one person or group with reference to those of another". Politics is the exercise of power in a relatively unstable equilibrium of dynamic social forces. Its motive forces are the "desires of single human beings". The final residence of power then is in the minds and hearts of individual men and women. Hence the study of politics becomes the study of human psychology. Law is the supreme "regulation of power" arising from man's passion for routine and regularity. It is impossible in a brief notice to do justice to this book. It should be required reading for all students of government and especially for those who profess to teach Political Science.

PETER H. ODEGARD

OHIO STATE UNIVERSITY

J. G. Hamanns Stellung in der Philosophie des 18. Jahrhunderts. Von ERWIN METZKE. Halle, Max Niemeyer, 1934. Pp. viii, 121-266.

Influenced by Biblical tradition, Hamann believed that man was sinful and his state hopeless unless saved by the grace of God. His conversion confirmed him in this conviction. It is not surprising, therefore, that faith and God are fundamental to his philosophy; that he dedicated his life and thought to the glorification of God; that he frowned on the rationalist's effort to unravel the cosmic mysteries; that he asks for more life, more God-consecrated life, and less abstract thought which only confuses the mind. The book should prove helpful to students of philosophy and of religion; its style is readable and fluent.

ADAM ALLES

ST. JOHN'S COLLEGE
ANNAPOLIS, MARYLAND

Moral, Wille und Weltgestaltung. Grundlegung zur Logik der Sitten. Von KARL MENGER. Wien, Julius Springer, 1934. Pp. iv, 144.

A mathematician writes on ethics. He argues: Geometries differ because their assumptions differ; similarly systems of ethics differ because they assume different norms. The author considers it his task to trace the implications of ethical norms in their application to actual conditions, just as he would trace those of mathematical assumptions. To illustrate. If the Moral Law prescribes monogamy, the practicability of that command

depends on certain factors within the social group—the proper balance of males and females, the attitude of its members toward it: whether they accept, are indifferent to, or reject the command.

ADAM ALLES

ST. JOHN'S COLLEGE
ANNAPOLIS, MARYLAND

Das Gesundheitswesen bei Aristoteles. Von PAUL KALTHOFF. Berlin, Ferd. Dummlers, 1934. Pp. xvi, 372.

This book is a collection of all passages in the works of Aristotle which are related to medical science and hygiene. The passages are given in German translation and are gathered into thirty-four chapters dealing with a variety of subjects all the way from governmental health-regulations to microorganisms and psychiatry. Unfortunately this method involves a considerable amount of repetition in the various chapters, as one passage may have significance for several different medical subjects. There is little attempt to evaluate Aristotle's contribution to medical science, but a thorough exposition of his medical knowledge.

B. C. HOLTZCLAW

UNIVERSITY OF RICHMOND

Value and Reality in Bradley's Philosophy. By TORGNY T. SEGERSTEDT. Lund, A. B. Gleerupska Univ.-Bokhandeln, 1934. Pp. iv, 268.

With detailed and progressive argumentation this systematic essay critically elucidates the identification of value and reality in the philosophy of Bradley. The development of the concept of reality from that of mere logical totality to that of perfect, single, immediate, and satisfying experience is expounded with painstaking fidelity to Bradley's own definitions and reflections. The author carefully describes in logical succession the Bradleyan ideas of reality, value, valuation, and value-judgment. The rigorous examination of Bradley's interpretation of realization, hedonism, and other ethical concepts, is an excellent illustration of discriminating and illuminating philosophical exposition. The difficulties in Bradley's view of the value-judgment are disclosed in an extended analytical discussion of the epistemological and axiological positions of G. E. Moore and Axel Hägerström. From this volume the reader will gain very little knowledge of the historical background and the contemporary influence of the philosophy examined, but in it he will discover an orderly, clear, and exhaustive commentary on the Bradleyan theory of reality and value.

D. LUTHER EVANS

THE COLLEGE OF WOOSTER

Materialism, the Scientific Bias. By HENRY FELIX MINS, JR. A Thesis. New York, 1934. Pp. 120.

Are you seeking an abundantly documented and concisely summarized historical survey of the main types of materialism? Are you looking for a condensed expository and critical statement of the method and ontology of physics? Are you in search of pointed arguments against the leading totalistic and teleological approaches to the philosophy of science? Then

consult, for a fair measure of immediate satisfaction, the lucid and simplified analyses of this doctoral dissertation. You may not become convinced that scientific knowledge is the only knowledge we have, and you may not be persuaded that materialism, however legitimate as the scientific bias in philosophy, is the only rational metaphysics, but you will welcome the author's scholarly attempt to deflate the extreme claims of both positivists and romanticists in contemporary philosophies of science.

D. LUTHER EVANS

THE COLLEGE OF WOOSTER

A Natural Approach to Philosophy. By LEWIS GUY ROHRBAUGH. New York, Noble and Noble. 1934. Pp. xiv, 482.

Although this book is not, in any special or convincing sense, "a natural approach to philosophy", it is a successful exhibition of the relevancy and value of scientific information in philosophical exposition. Examining, with a super-abundance of descriptive detail, the usual ontological and cosmological issues, the volume submits, in an ambitious array of well-chosen sketches, the most important findings in the development of the physical and biological sciences. The psychological, epistemological, and axiological problems of philosophy also receive profusely authenticated discussion. The work is superior to the average introduction to philosophy in the multiplicity and the appropriateness of its illustrative references to the great thinkers of the philosophical tradition. The book, however, is deficient both in its treatment of the current logical and metaphysical controversies, and in its attention to the philosophical importance of the momentous tendencies in contemporary economics and politics. A compendious and definitive survey of the essential and persistent doctrines of philosophy, the volume is a work which, in its frank appeal to student-interest and in its liberally cultural perspective, should prove to be a very acceptable text book for college courses in elementary philosophy. The author provides a complete index and good bibliographical lists.

D. LUTHER EVANS

THE COLLEGE OF WOOSTER

Das Phänomen des Glaubens. Das Problem seines metaphysischen Gehalts. Halle, Max Niemeyer, 1934. Pp. xii, 256.

The phenomenon of faith is the theme of this book. The author finds that faith, in all its forms, implies a belief in the present or future existence of its object where this object is not actually given to the senses. Trust and confidence are essential characteristics of faith. Through religious faith the individual is freed from fear and despair and is filled with new hope and cheer although the objective world itself may not have changed at all. This faith is not an intellectual conclusion derived from new knowledge of the nature of things; it is hope and trust "trotzdem", in spite of all evidences to the contrary. The religious individual feels it as an influx from the outside and attributes it to God and his love. Does this prove the objective existence of God? The author does not think so. But, since faith places man in harmony with the universe while unbelief isolates and

weakens him, the probability exists that theism contains more truth than atheism.

P. Epp

Ohio State University

La philosophie religieuse en Grande-Bretagne de 1850 à nos jours. Par Maurice Nédoncelle. Paris, Librairie Bloud et Gay, 1934. Pp. 234.

Having given in an introductory chapter a general survey of British philosophy of religion from 1850 onward, M. Nédoncelle devotes the four following chapters to Mansel, Pringle-Pattison, Whitehead, and Inge; Balfour is discussed in an appendix to the chapter on Mansel, and Schiller in one at the end of the chapter devoted to Pringle-Pattison. The concluding chapter deals in part with recent British criticisms of the scientific worldview, and in part with current discussions of the value-problem, both criticized in the light of Newman's philosophy. M. Nédoncelle has, no doubt, a great deal to offer such of his countrymen as want an easy and reliable introduction to British philosophy in their own language. To British and American readers, on the other hand, the work is of scant value, being of interest chiefly because it gives them a fair, modest, and urbane Catholic interpretation of recent British Protestant thought. The style is clear but, in spite of occasional, happy witticisms—such as, "Le pragmatisme en Grande-Bretagne, c'est Schiller"—generally undistinguished.

Sven Nilson

Minneapolis, Minnesota

Natur und Wahrheit. Untersuchung über Entstehung und Entwicklung des Schellingschen Systems bis 1800. Von Kurt Schilling. München, Ernst Reinhardt, 1934. Pp. 141.

In the belief that owing to a lack of understanding of the philosophical nature of the problems proposed by German Idealism much still remains to be done in that field, the author has made a beginning with a study of Schelling's first period. His book provides a critical exposition of Schelling's writings until 1800, with especial emphasis upon the influences under which Schelling wrote. He maintains that in spite of their close personal relationship Schelling and Fichte were never in more than surface agreement, and that what has been regarded as a change of standpoint in Schelling was rather a growing realization of the presuppositions of his own doctrines. Not Fichte but the Kant of the *Kritik der Urtheilskraft* was in reality the teacher of the young Schelling. The book is written with the conviction that Schelling's philosophy is of importance for the intellectual problems of the present, but in what respect is not made altogether clear.

G. N. Dolson

New York City

Was will die Phänomenologie Edmund Husserls? Von Eugen Fink. Berlin, Junker und Dünnhaupt, 1934. Pp. 18.

On the occasion of Husserl's 75th birthday his closest collaborator presents us here with an attempt to give the philosophical world "an authentic

introduction into Husserl's thought-world". Fink insists that "the real and central meaning of the philosophy of Edmund Husserl is still unknown today" (15). The reason for this fact lies in the very nature of phenomenology. "The appropriation of its true meaning can never occur within the horizon of our natural epistemological attitude. The approach to phenomenology demands a deep-going, radical reversal of our whole being . . ." (15). With this frank introduction Dr. Fink proceeds to answer the titular question. Whether he succeeds or not, no student of Husserl or of phenomenology can afford to miss this sincere effort to make clear" the fundamental ideas of phenomenology".

PAUL ARTHUR SCHILPP

LOS ANGELES, CALIFORNIA

The following books have been received:

The Political Philosophies of Plato and Hegel. By M. B. FOSTER. New York, Oxford University Press, 1935. Pp. xiv, 208.

Paul Elmer More and American Criticism. By ROBERT SHAFER. New Haven, Yale University Press, 1935. Pp. xii, 324.

Imagination and Human Nature. By LIVINGSTON WELCH. Psyche Monographs, No. 3. London, Kegan Paul, Trench, Trubner & Co., 1935. Pp. 224.

Evolution of Hindu Moral Ideals. By P. S. SIVASWAMY AIYER. Calcutta, Calcutta University, 1935. Pp. xxii, 242.

The Mind and Society. Treatise on General Sociology. By VILFREDO PARETO, Edited by ARTHUR LIVINGSTON. Translated by ANDREW BONGIORNO and ARTHUR LIVINGSTON. Volume I: Non-logical Conduct. Volume II: Analysis of Sentiment. Volume III: Sentiment in Thinking. Volume IV: The General Form of Society. New York, Harcourt, Brace and Company, 1935. Pp. xviii, 1-498; viii, 499-884; viii, 885-1432; viii, 1433-2032.

The Psychology of Human Behavior. By JOSEPH HARRY GRIFFITHS. New York, Farrar & Rinehart, Inc., 1935. Pp. xxii, 516.

Powers That Be. The Mayfair Lectures. By ALEXANDER CANNON. New York, E. P. Dutton & Co., Inc., 1935. Pp. xvi, 222.

The Psycho-Biology of Language. An Introduction to Dynamic Philology. By GEORGE KINGSLEY ZIPF. Boston, Houghton Mifflin Company, 1935. Pp. xii, 336.

The Supreme Law. By MAURICE MAETERLINCK. Translated by K. S. SHELVANKAR. New York, E. P. Dutton & Co., 1935. Pp. vi, 160.

Gestalt Psychology. A Survey of Facts and Principles. By GEORGE W. HARTMANN. New York, The Ronald Press Company, 1935. Pp. xiv, 326.

Sage of Sakori. By B. V. NARASIMHA SWAMI. Madras, 1935. Pp. x, 178.

Saint Thomas Aquinas. By ÉTIENNE GILSON. Annual Lecture on a Master Mind. From the Proceedings of the British Academy, Volume XXI. London: Humphrey Milford, 1935. Pp. 20.

Pareto's General Sociology. A Physiologist's Interpretation. By LAWRENCE J. HENDERSON. Cambridge, Harvard University Press, 1935. Pp. x, 120.

La méditation Bouddhique. Étude de sa théorie et de sa pratique selon l'École du Sud. Par G. CONSTANT LOUNSBERRY. Paris, Adrien-Maisonneuve, 935. Pp. 180.

Bilan de la sociologie française contemporaine. Par C. BOUGLÉ. Paris, Félix Alcan, 1935. Pp. viii, 172.

La pensée religieuse de Friedrich von Hügel. By MAURICE NÉDONCELLE. Paris, J. Vrin, 1935. Pp. vi, 224.

Recherches sur la Préparation Évangélique d'Eusèbe et l'édition perdue des œuvres de Plotin. Par PAUL HENRY. Paris, Ernest Leroux, 1935. Pp. xii, 144.

Meister Eckharts Ethik. Von HERMA PIESCH. Luzern, Vita Nova Verlag, 1935. Pp. xvi, 184.

Maimonides, eine Biographie. Von ABRAHAM HESCHEL. Berlin, Erich Reiss, 1935. Pp. x, 288.

Recht und Sittlichkeit. Von RUDOLF LAUN. Berlin, Julius Springer, 1935. Pp. vi, 110.

Die Realität vom Standpunkte des Epallelismus. Von A. JANEK. Riga, 1935. Pp. 18.

Charles Maurras und die Weltanschauung der Action Française. Mit einer monographischen bibliographie Charles Maurras. VON HANS NAUMANN. Leipzig, S. Hirzel, 1935. Pp. xii, 98.

Das Handeln im Sinne des höchsten Zieles. Von HUGO DINGLER. München, Ernest Reinhardt, 1935. Pp. 160.

Magistri Eckardi Opera Latina. II: Opus Tripartitum Prologi. Edidit HILDEBRANDUS BASCOUR. Lipsiae, Felix Meiner, 1935. Pp. x, 40.

NOTES

The Organizing Committee of the Ninth International Congress of Philosophy announces that the sessions will take place in Paris from the 1st to the 6th of August, 1937. The usual interval of four years between these Congresses has been shortened to three in order to celebrate the Tercentenary of the *Discours de la méthode.*

Starting from the Cartesian image of the "tree" of philosophy, the Organizing Committee has come to the conclusion that the fundamental problem of this Congress should be the unity of method in the various intellectual activities. The Committee feels that this problem, which was that of Descartes, is still central today; for it amounts to the question what is the nature and the validity of reason, and method is simply reason in action. The Committee has sought for subjects that would give the opportunity to examine this problem under a living and concrete aspect, and it proposes the following:

1. The present state of Cartesian studies.
2. The unity of knowledge; method and methods. The history of the problem in antiquity, the Middle Ages, and modern times.
3. Logic and mathematics.
4. Causality and determinism in physics and in biology. Probability and statistics.
5. The relations between soul and body.
6. Reflective analysis and transcendence.
7. Value, standards (moral, social, and aesthetic) and reality.

The definitive program will be announced later, but from now on the Committee will be glad to learn the titles of any papers which it is proposed to address to the Congress. In accordance with custom, the languages recognized at the Congress will be English, French, German, and Italian. It is requested that all communications and suggestions be addressed to M. Émile Bréhier, professeur à la Sorbonne, 40 rue de l'Yvette, Paris XIV°.

The American Council of Learned Societies offers grants designed to assist research by scholars who are trained in scientific methods of investigation. The maximum of the grants is three hundred dollars. Small additional allowances may, however, be made at the discretion of the Committee to meet unusual expenses involved in the research; the nature of such expenses must be indicated in the application.

Applicants must be citizens of the United States or Canada or permanently employed or domiciled therein; they must be *actually engaged* in the research for which they request assistance, and must *personally be in need* of the aid for which they apply.

Applicants must possess a doctor's degree or its equivalent in training, study, and experience. No grants will be made to assist in the fulfillment of requirements for any academic degree.

Applications must be made in duplicate upon special forms provided for that purpose, and must be mailed to the Secretary for Fellowships and

Grants, American Council of Learned Societies, 907 Fifteenth Street, Washington, D.C., not later than January 15. Awards will be made in April.

The following is a list of articles in current philosophical periodicals:

THE JOURNAL OF PHILOSOPHY, XXXII, 9: *John Dewey,* The Future of Liberalism; *William Ernest Hocking,* The Future of Liberalism. 10: *John Herman Randall, Jr.,* Liberalism as Faith in Intelligence; *Ralph W. Church,* On Dr. Ewing's Neglect of Bradley's Theory of Internal Relations; *A. C. Ewing,* Reply. 11: *Charles A. Baylis,* The Nature of Evidential Weight; *Paul Weiss,* Time and the Absolute; Abstracts of Papers Read at the Thirty-Sixth Annual Meeting of the Western Division of the American Philosophical Association. 12: *Daniel Cory,* The Kinds of Perception and Knowledge; *Newton P. Stallknecht,* Awareness of Actuality in the Esthetic Experience; *Percy Hughes,* Discussion; Is Solipsism Intelligible?

ANGLICAN THEOLOGICAL REVIEW, XVII, 2: *Frederick C. Grant,* Worship and Experience; *W. Norman Pittenger,* Dr. Bouquet's "Modern Handbooks of Religion"; *Sherman Eldridge Johnson,* A Note on Luke xiii, 1-5.

THE HARVARD THEOLOGICAL REVIEW, XXVIII, 2: *Harry Austryn Wolfson,* The Internal Senses in Latin, Arabic, and Hebrew Philosophic Texts; *Leslie Webber Jones,* The Text of the Bible and the Script and Art of Tours.

PHILOSOPHY OF SCIENCE, II, 2: *C. J. Ducasse,* Is Scientific Verification Possible in Philosophy?; *Paul Arthur Schilpp,* The Nature of the 'Given'; *Louis Osgood Kattsoff,* Postulational Methods I; *Henry Margenau,* Methodology of Modern Physics; *Harry Ruja,* Samuel Alexander's Concept of Space-Time; *Lawrence K. Frank,* Structure, Function and Growth; *Edwin G. Boring,* The Relation of the Attributes of Sensation to the Dimensions of the Stimulus; *John Somerville,* The Forgotten Problem: Aims in Science.

ANALYSIS, II, 5: *Moritz Schlick,* Facts and Propositions; *Austin E. Duncan-Jones,* Is Strict Implication the Same as Entailment?; *J. O. Wisdom,* The Analysis of Sense-Data.

THE AUSTRALASIAN JOURNAL OF PSYCHOLOGY AND PHILOSOPHY, XII, 1: *W. R. Boyce Gibson,* The Ethics of Nicolai Hartmann (III); *John Anderson,* Marxist Philosophy; *P. H. Partridge,* Progress in Evolution; *A. Campbell Garnett,* A Theory of the Nature and Criteria of Truth.

THE AMERICAN JOURNAL OF PSYCHOLOGY, XLVII, 2: *E. V. Fehrer,* An Investigation of the Learning of Visually Perceived Forms; *K. H. Baker* and *M. G. Eye,* The Reliability of the pH of Human Mixed Saliva as an Indicator of Physiological Changes Accompanying Behavior; *H. E. Jones,* The Galvanic Skin Reflex as Related to Overt Emotional Expression; *C. Van Riper,* An Experimental Study of the Japanese Illusion; *O. C. Trimble,* Intensity-Difference and Phase-Difference as Conditions of Stimulation in Binaural Sound-Localization; *J. G. Needham,* Rate of Presentation in the Method of Single Stimuli; *J. D. Frank,* Some Psychological Determinants of the Level of Aspiration; *E. L. Thorndike,* Measurements of the Influence of Recency; *M. N. Crook and H. Crook,* Adaptation to Cutaneous Pressure; *E. D. Sisson,* Eye-Movements and the Schröder Stair-Figure.

PSYCHOLOGICAL REVIEW, XLII, 3: *Clark L. Hull*, The Mechanism of the Assembly of Behavior Segments in Novel Combinations Suitable for Problem Solution; *Douglas McGregor*, Scientific Measurement and Psychology; *Water Joël*, On the Tactile Perception of Vibration Frequencies; *Kenneth L. Smoke*, The Experimental Approach to Concept Learning; *Neal E. Miller*, A Reply to 'Sign-Gestalt or Conditioned Reflex?'; *Henry E. Garrett*, The Two-Factor Theory and its Criticism.

JOURNAL OF EXPERIMENTAL PSYCHOLOGY, XVIII, 3: *S. R. Hathaway*, An Action Potential Study of Neuromuscular Relations; *H. L. Hollingworth*, The Conditions of Verbal Configuration; *H. Cason*, An Attempt to Condition Hand Withdrawal Responses in Human Subjects; *S. K. Chou*, Reading and Legibility of Chinese Characters: IV. An Analysis of Judgments of Positions of Chinese Characters by American Subjects; *H. Goldstein*, The Biochemical Variability of the Individual in Relation to Personality and Intelligence; *C. Van Riper*, The quantitative Measurement of Laterality; *W. A. Hunt* and *E. B. Hunt*, A Comparison of Five Methods of Scoring the Galvanic Skin Response; *E. L. Thorndike* and *R. T. Rock, Jr.*, A Further Note on Learning without Awareness of What is Being Learned; *F. W. Irwin*, A Rejoinder.

PSYCHOLOGICAL BULLETIN, XXXII, 5: *E. H. Kemp*, A Critical Review of Experiments on the Problem of Stimulation Deafness; *C. N. Allen*, Recent Research on Sex Differences; *Martin F. Fritz*, The Effect of Diet on Intelligence and Learning. 6: *David Katz*, Georg Elias Müller; *Steuart H. Britt*, Retroactive Inhibition.

REVUE DE MÉTAPHYSIQUE ET DE MORALE, XLI, 2: *Ed. Le Roy*, Ce que la Microphysique apporte ou suggère à la Philosophie (1); *R. Berthelot*, L'Astrobiologie et la Pensée de l'Asie: essai sur les origines des sciences et des thèories morales (suite); *J. Delvolvé*, Rôle esthétique de la Récurrence (suite et fin).

REVUE PHILOSOPHIQUE, LX, 5 et 6: *M. Halbwachs*, Les facteurs biologiques et la population; *H. Wallon*, L'étude du caractère chez l'enfant et l'orientation professionelle; *Ch. Baudouin*, La philosophie politique de Ch. Renouvier; *R. Ruyer*, Le versant réel du fonctionnement.

REVUE D'HISTOIRE DE LA PHILOSOPHIE ET D'HISTOIRE GÉNÉRALE DE LA CIVILISATION N. S. IX: *René Hubert*, Essai sur l'histoire de l'idée de Progrès (suite et fin); *Wiktor Wasik*, L'aristotélisme populaire comme fragment de la Renaissance; *Bernard Guyon*, Balzac et le Feuilleton des journaux politiques.

ARCHIVES DE PSYCHOLOGIE, XXIV, 96: *André Rey*, D'un procédé pour évaluer l'éducabilité; *Irene Mourachowsky*, La motricité faciale chez les enfants en bas âge; *Ed. Claparède*, Sur la nature et la fonction du jeu.

SCHOLASTIK, X, 2: *Artur Landgraf*, Die Abhängigkeit der Sünde von Gott nach der Lehre der Frühscholastik; *August Brunner*, Der echte Gegensatz, die Gestalt und die Seinsstufe des Biologischen; *Franz Pelster*, Die ersten beiden Kapitel der Erklärung Alberts des Grossen zu De animalibus in ihrer ursprünglichen Fassung; *Bernhard Jansen*, Die Seelenlehre Olivus und ihre Verurteilung auf dem Vienner Konzil.

RIVISTA DI FILOSOFIA, XXVI, 2: *G. Solari*, Rosmini inedito; *L. Geymonat*,

Nuovi indirizzi della filosofia Austriaca; *E. Lolli,* Introduzione ad uno studio sull' induzione neurica. Impostazione generale e psicologica.

Logos, XVIII, 1: *N. Ramagli,* Cattolicesimo e calvinismo nella controversia di Bossuet e Ferry; *L. Rossi,* Fenomenismo e pampsichismo; *E. Nobile,* A. proposito di una possibile obiezione gnoseologica ad una filosofia dualistica; *N. Petruzzellis,* Il problema della storia nell'idealismo moderno.

Giornale Critico Della Filosofia Italiana, III, 2: *J. Teicher,* Spunti cartesiani nella filosofia arabo-guidaica; *B. Maniò,* Sui fondamenti della geometria; *G. Cogni,* Studi hegeliani.

Rivista di Filosofia Neo-Scolastica, XXVII, 2: *F. Olgiati,* Il superrealismo di Francesco Orestano; *L. Pelloux,* Il problema del male nella dottrina di Kant; *G. Ceriani,* La gnoseologia e il massimo problema di Bernardino Varisco; Riassunti degli articoli.

Annali Della R. Scuola Normale Superiore di Pisa, IV, 1: *M. Norsa, G. Vitelli,* Da Papiri della Società Italiana; *L. Russo,* Introduzione ai "Promessi Sposi"; *G. Pasquali,* La lettera VIII di Platone.

Scientia, LVII, 6: *F. Angel,* Ziele und Aufgaben der Paragenesenforschung; *L. Baudin,* La découverte de la circulation du sang; *T. Burrow,* Fallacies of the Senses (2); *F. Vinci,* Il metodo statistico nello studio dei fatti sociali.